

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

**Determine the amplitude or period as requested.**

1) Amplitude of  $y = 4 \sin x$

- A)  $4\pi$                       B)  $\frac{\pi}{4}$                       C) 4                      D)  $2\pi$

Answer: C

2) Period of  $y = -2 \sin x$

- A)  $\frac{\pi}{2}$                       B) 2                      C)  $\pi$                       D)  $2\pi$

Answer: D

3) Amplitude of  $y = -\frac{1}{4} \sin x$

- A)  $\frac{\pi}{4}$                       B) 4                      C)  $\frac{1}{4}$                       D)  $-\frac{1}{4}$

Answer: C

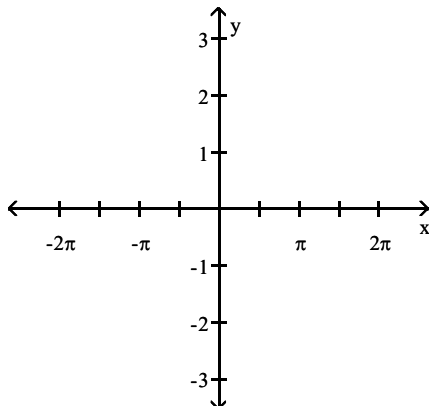
4) Period of  $y = -\frac{1}{4} \sin x$

- A)  $-\frac{1}{4}$                       B)  $\pi$                       C)  $\frac{\pi}{4}$                       D)  $2\pi$

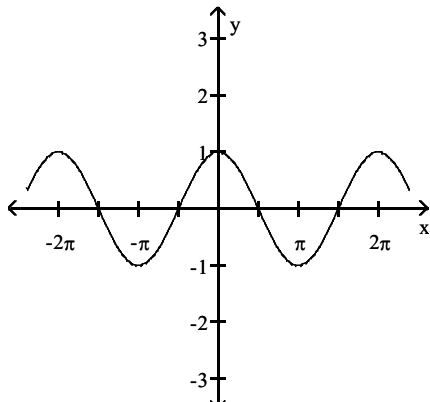
Answer: D

**Graph the function.**

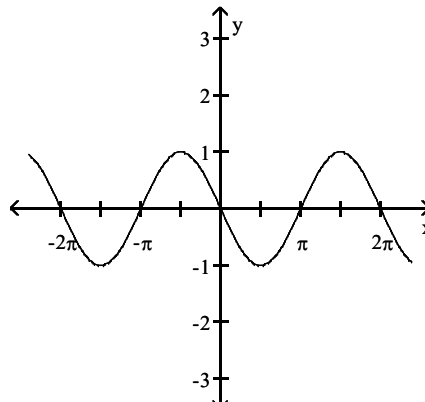
5)  $y = \sin x$



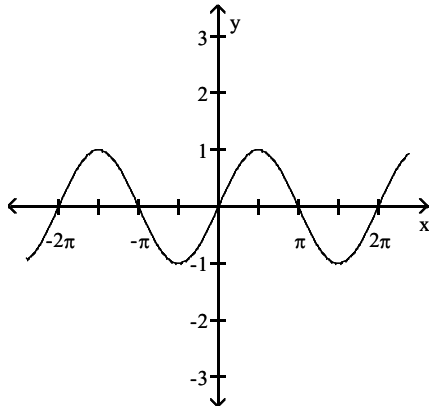
A)



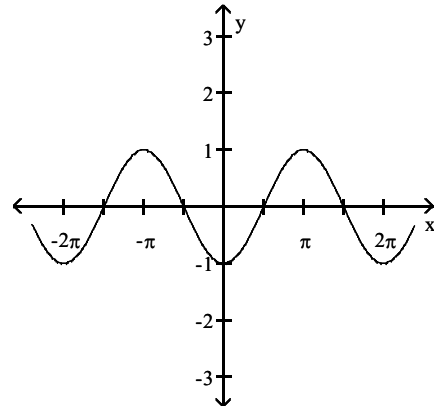
B)



C)



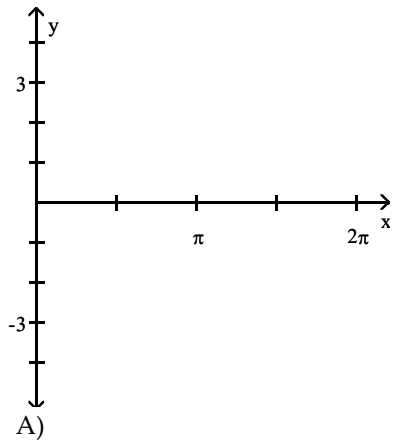
D)



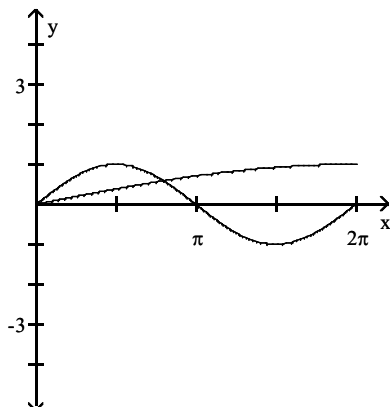
Answer: C

Graph the function and  $y = \sin x$  in the same rectangular system for  $0 \leq x \leq 2\pi$ .

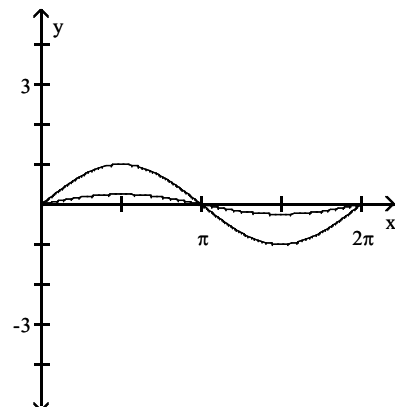
6)  $y = \frac{1}{4} \sin x$

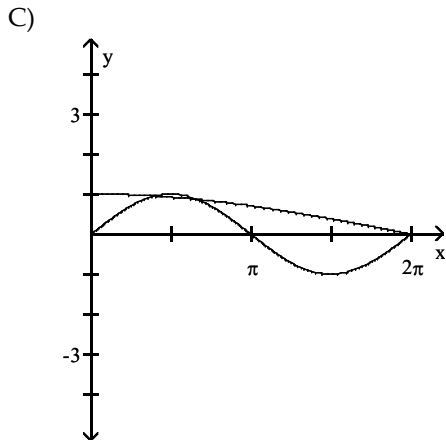


A)

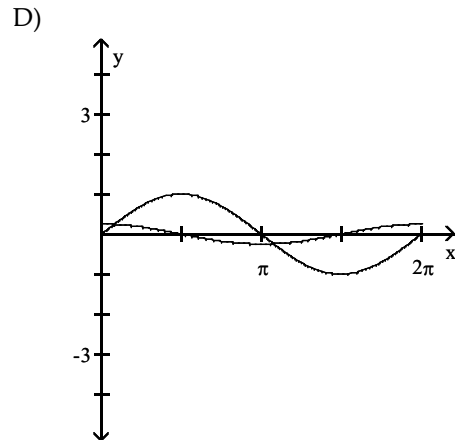


B)





Answer: B



**Determine the amplitude or period as requested.**

7) Amplitude of  $y = 5 \sin \frac{1}{3}x$

A)  $\frac{\pi}{5}$

B)  $6\pi$

C) 5

D)  $\frac{5\pi}{3}$

Answer: C

8) Amplitude of  $y = -2 \sin 5x$

A)  $\frac{2}{5}$

B)  $\frac{\pi}{2}$

C) 2

D)  $\frac{\pi}{5}$

Answer: C

9) Period of  $y = \sin 5x$

A) 5

B) 1

C)  $2\pi$

D)  $\frac{2\pi}{5}$

Answer: D

10) Period of  $y = 3 \cos \frac{1}{4}x$

A)  $\frac{3\pi}{4}$

B)  $\frac{\pi}{4}$

C) 3

D)  $8\pi$

Answer: D

11) Period of  $y = 3 \sin 8\pi x$

A)  $\frac{1}{4}$

B)  $8\pi$

C)  $\frac{\pi}{4}$

D) 4

Answer: A

12) Period of  $y = \frac{9}{8} \sin \frac{8\pi}{7}x$

A)  $\frac{9\pi}{4}$

B)  $\frac{16\pi}{7}$

C)  $\frac{4}{9}$

D)  $\frac{7}{4}$

Answer: D

13) Period of  $y = 3 \sin\left(7x - \frac{\pi}{2}\right)$

A)  $\frac{7\pi}{2}$

B)  $\frac{7}{2}$

C)  $\frac{2\pi}{7}$

D)  $\frac{2}{7}$

Answer: C

14) Period of  $y = -5 \sin(4\pi x + 2\pi)$

A)  $\frac{1}{2}$

B)  $4\pi$

C) 2

D)  $\frac{\pi}{2}$

Answer: A

**Determine the phase shift of the function.**

15)  $y = \frac{1}{4} \sin(2x + \pi)$

A)  $\frac{\pi}{4}$  units to the right

B)  $\pi$  units to the left

C)  $-\frac{\pi}{2}$  units to the left

D)  $\frac{\pi}{2}$  units to the left

Answer: D

16)  $y = -5 \sin\left(x - \frac{\pi}{4}\right)$

A) -5 units down

B)  $\frac{\pi}{4}$  units to the left

C) -5 units up

D)  $\frac{\pi}{4}$  units to the right

Answer: D

17)  $y = -5 \sin\left(2x - \frac{\pi}{2}\right)$

A)  $5\pi$  units up

B)  $\frac{\pi}{4}$  units to the right

C)  $2\pi$  units down

D)  $\frac{\pi}{2}$  units to the left

Answer: B

18)  $y = 4 \sin\left(\frac{1}{4}x - \frac{\pi}{4}\right)$

A)  $\frac{\pi}{16}$  units to the left

B)  $\frac{\pi}{4}$  units to the right

C)  $\pi$  units to the right

D)  $\frac{\pi}{4}$  units to the left

Answer: C

19)  $y = \frac{1}{2} \sin(\pi x + 2)$

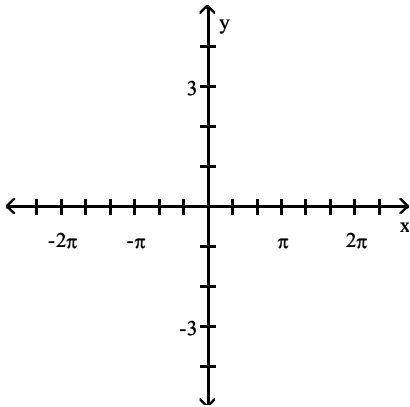
- A)  $\frac{2}{\pi}$  units to the left
- C)  $\frac{\pi}{2}$  units to the right

- B) 2 units to the left
- D)  $-\frac{\pi}{2}$  units to the left

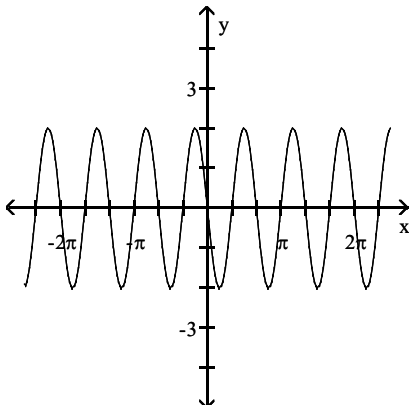
Answer: A

Graph the function.

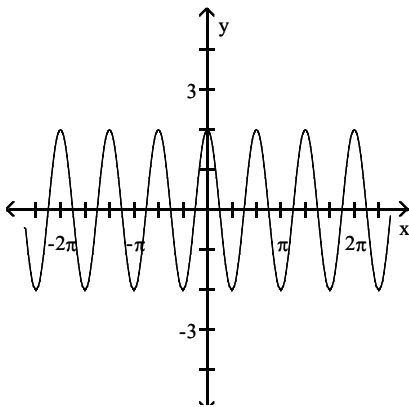
20)  $y = -2 \sin 3x$



A)

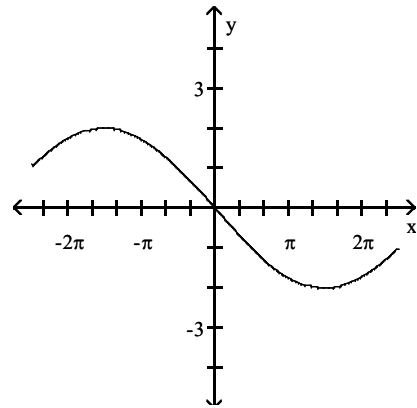


C)

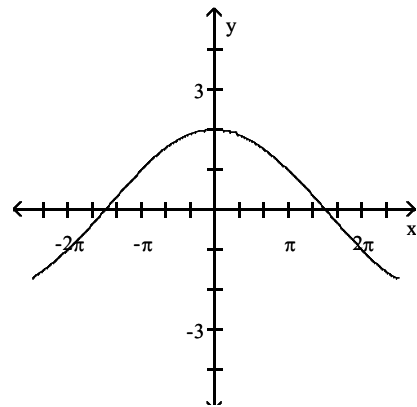


Answer: A

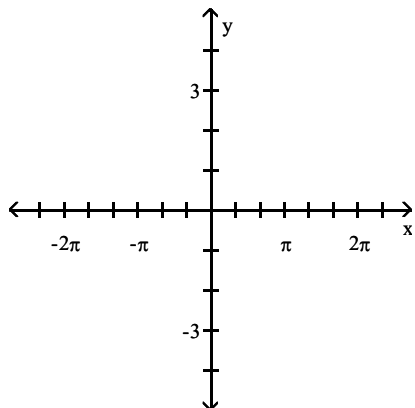
B)



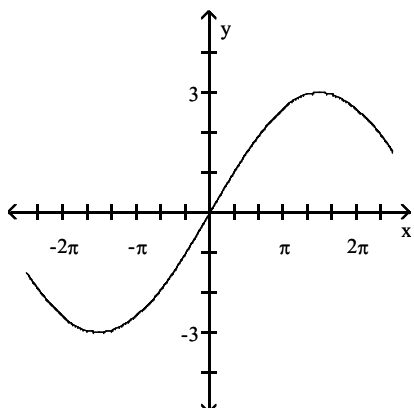
D)



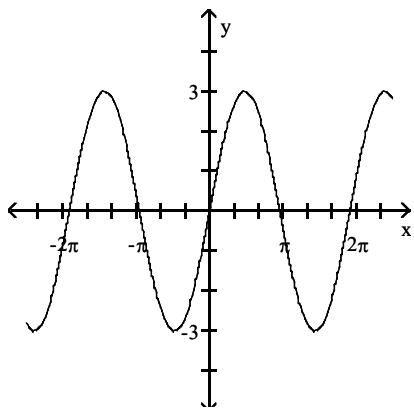
21)  $y = 3 \sin \frac{1}{3}x$



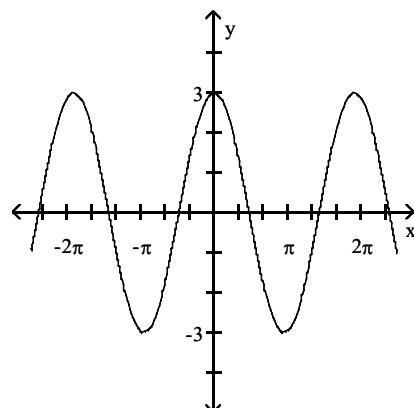
A)



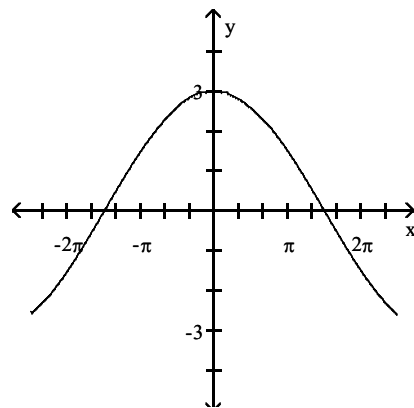
C)



B)

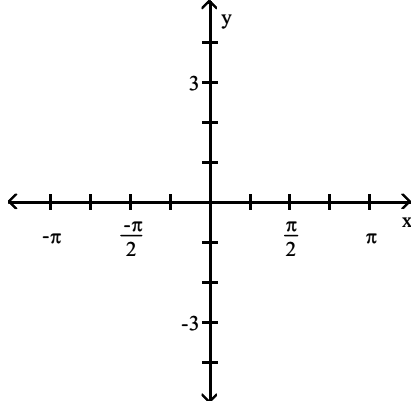


D)

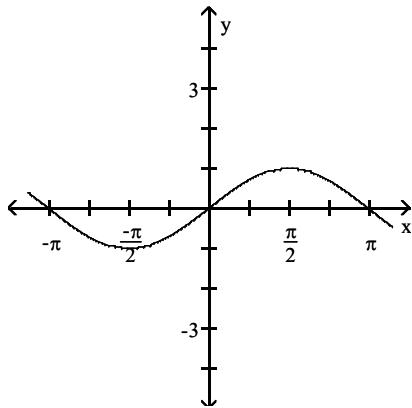


Answer: A

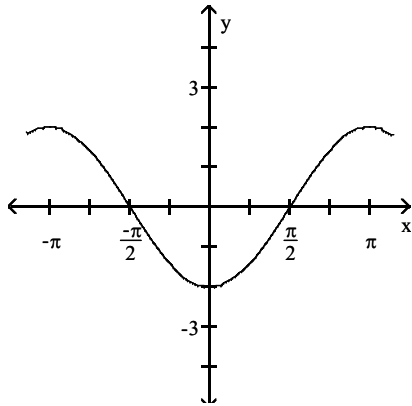
22)  $y = 2 \sin\left(x - \frac{\pi}{2}\right)$



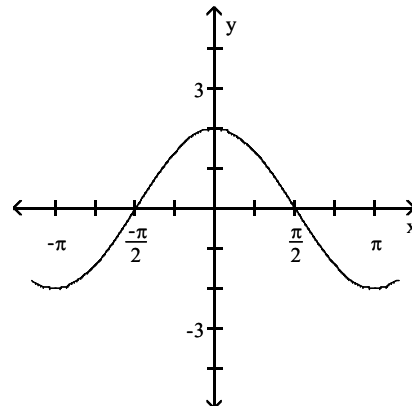
A)



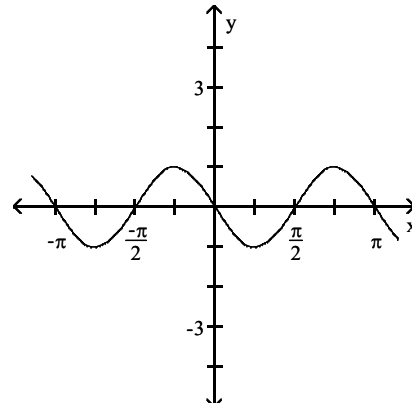
C)



B)

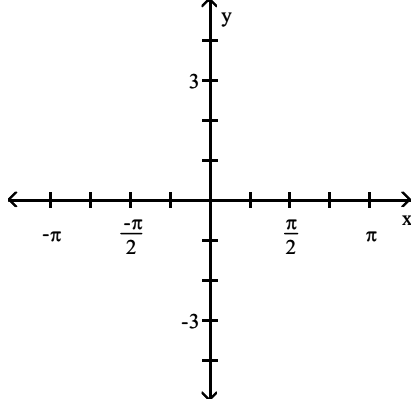


D)

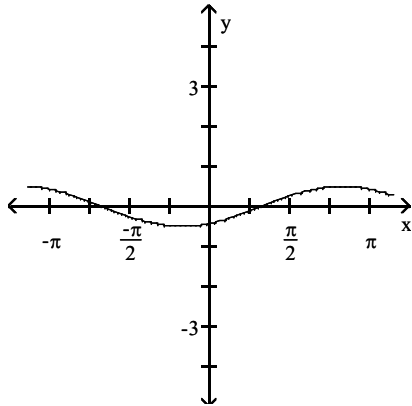


Answer: C

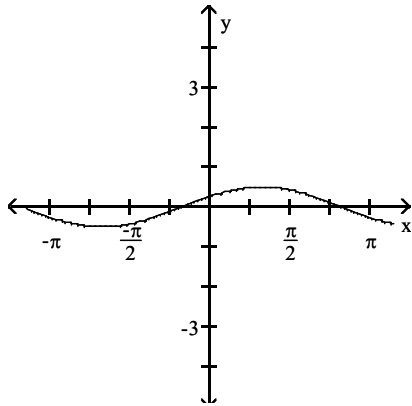
$$23) y = \frac{1}{2} \sin\left(x - \frac{\pi}{3}\right)$$



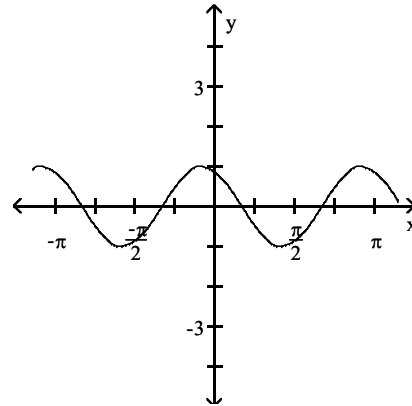
A)



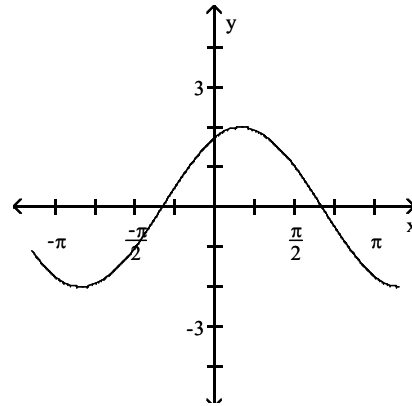
C)



B)



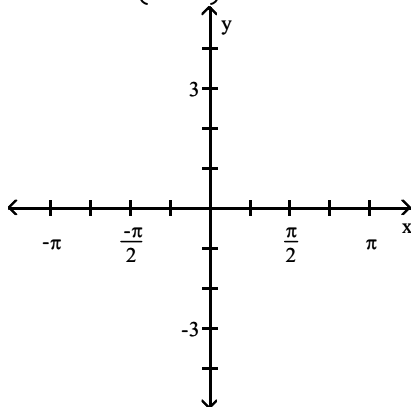
D)



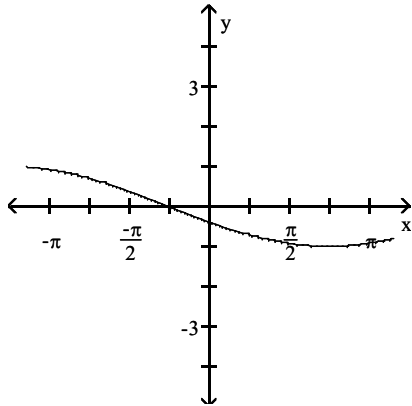
Answer: A



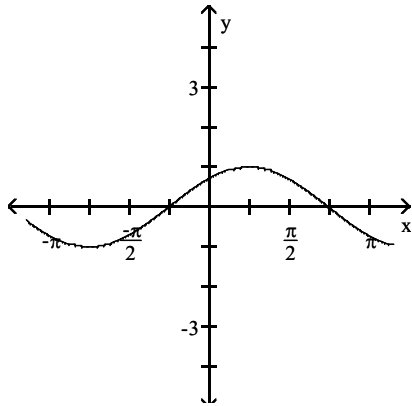
$$24) y = -\frac{1}{2} \sin\left(x - \frac{\pi}{4}\right)$$



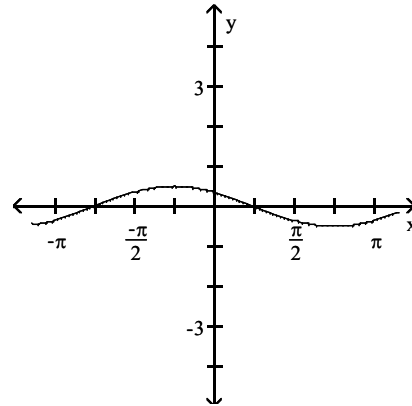
A)



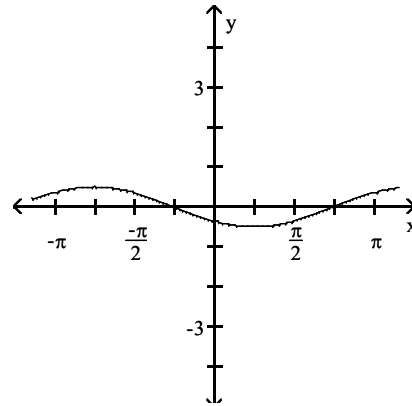
C)



B)

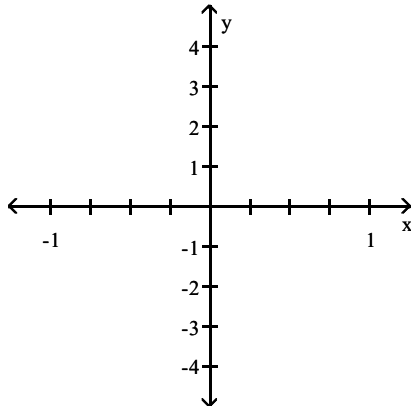


D)

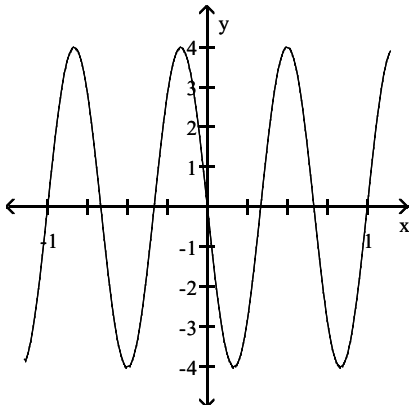


Answer: B

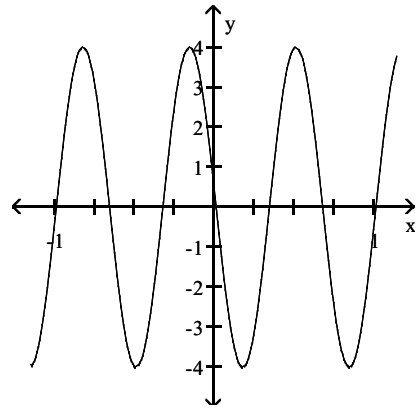
25)  $y = 4 \sin(3\pi x + 3)$



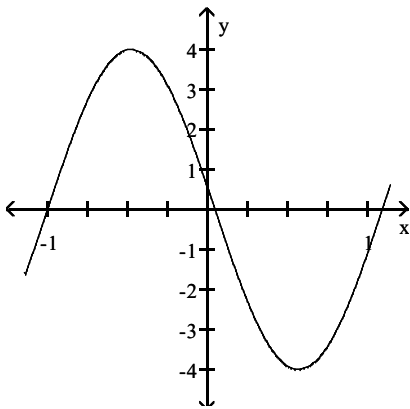
A)



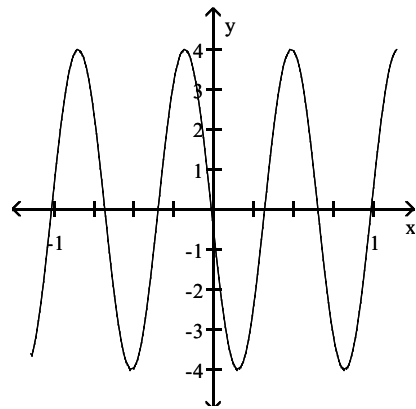
B)



C)

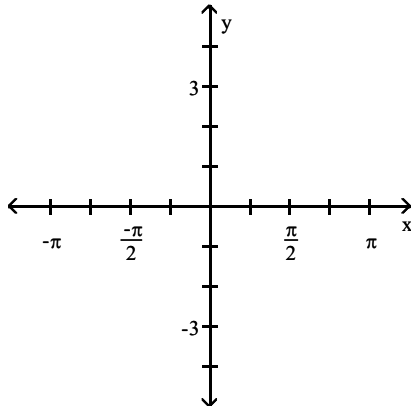


D)

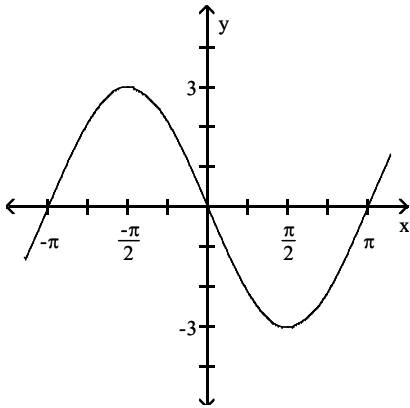


Answer: B

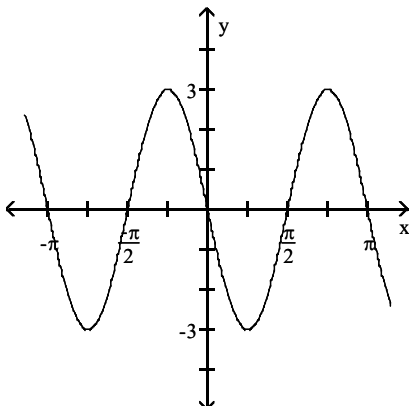
26)  $y = 3 \sin(2x + \pi)$



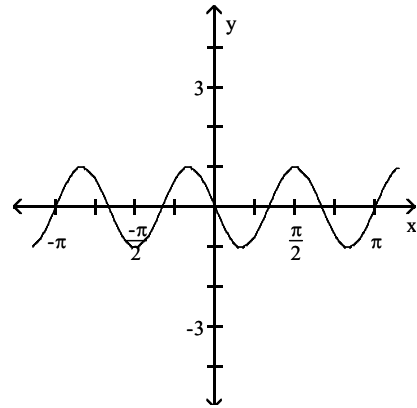
A)



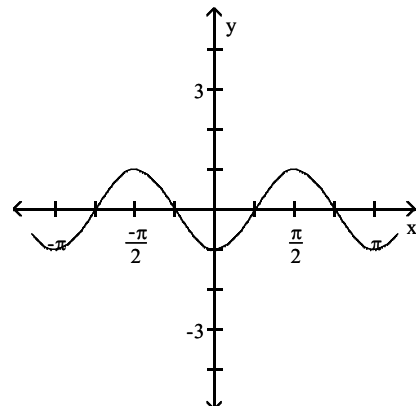
C)



B)

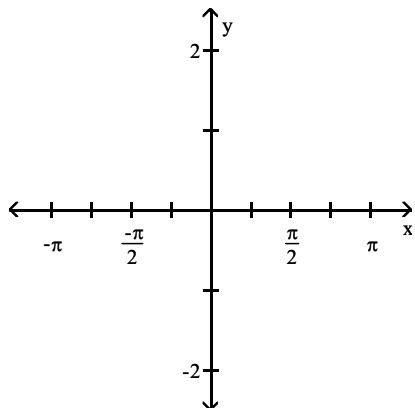


D)

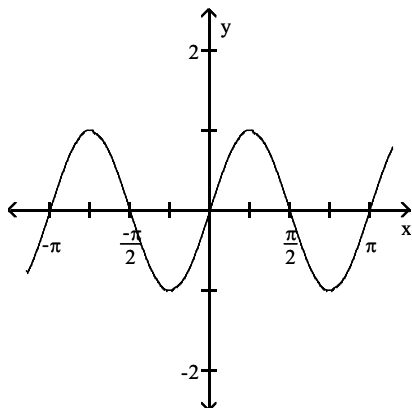


Answer: C

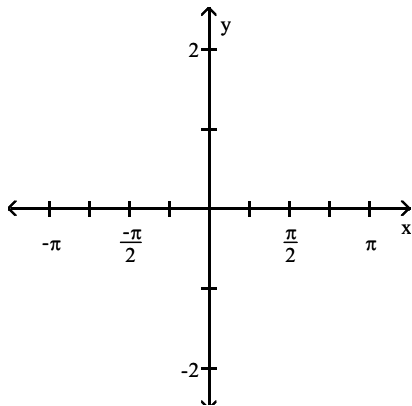
27)  $y = \frac{1}{2} \sin(x - \pi)$



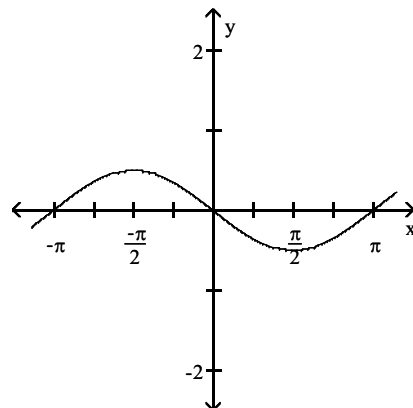
A)



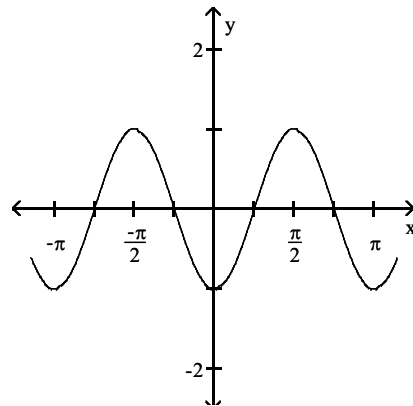
C)



B)

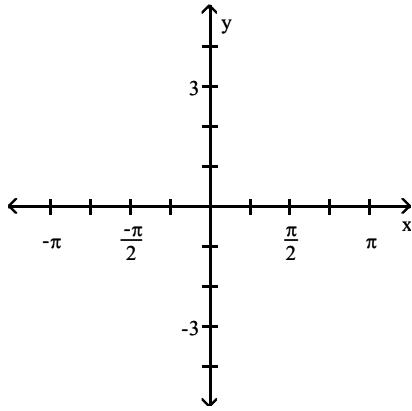


D)

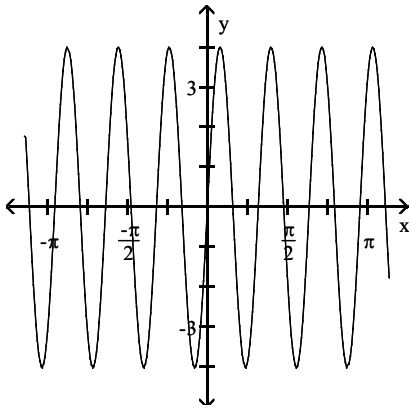


Answer: B

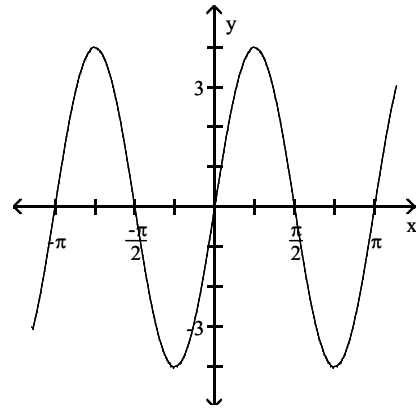
28)  $y = -4 \sin(2\pi x + 3\pi)$



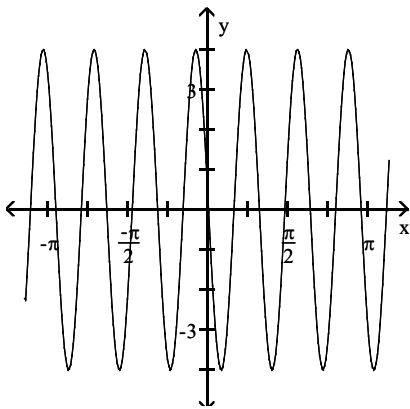
A)



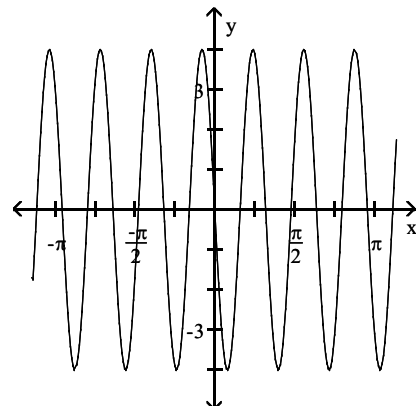
B)



C)

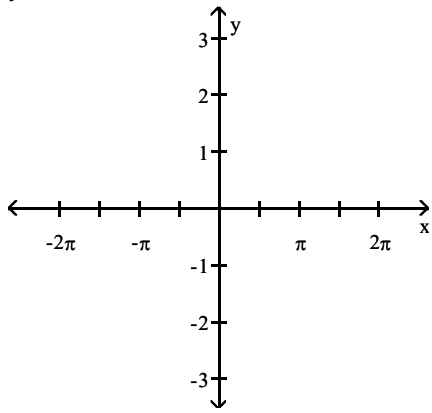


D)

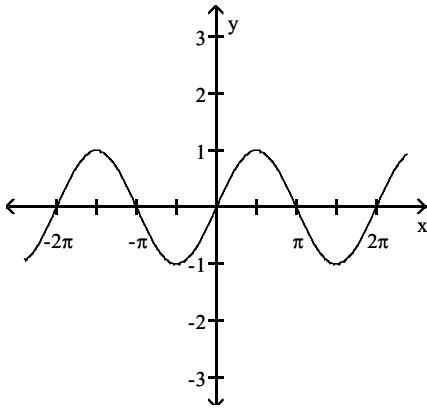


Answer: A

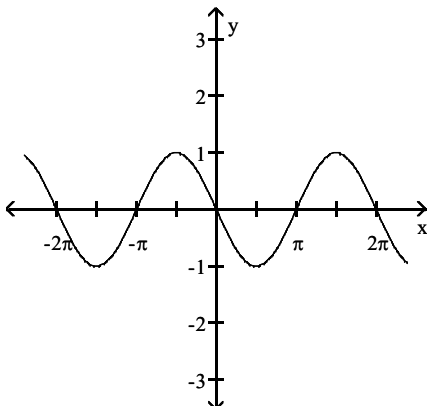
29)  $y = \cos x$



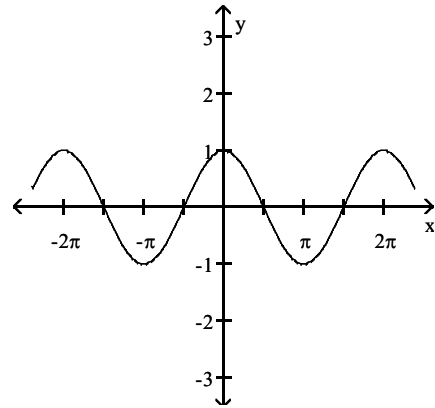
A)



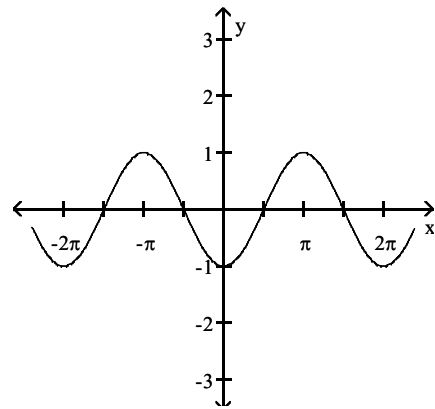
C)



B)



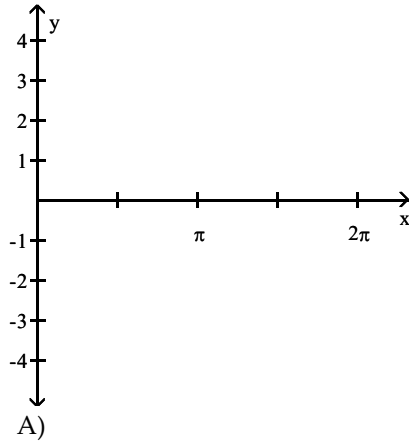
D)



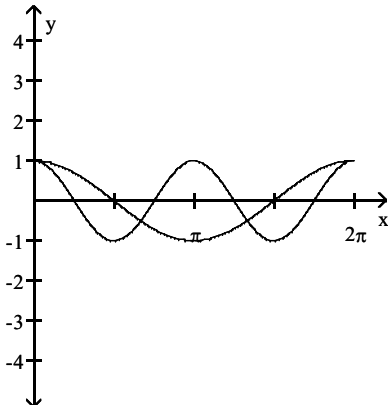
Answer: B

Graph the function and  $y = \cos x$  in the same rectangular system for  $0 \leq x \leq 2\pi$ .

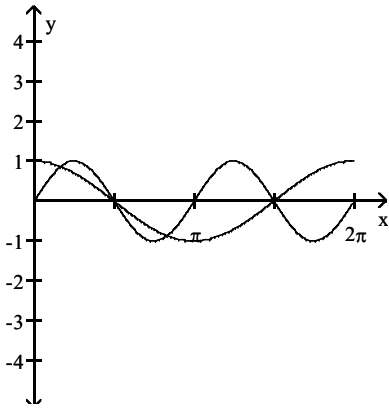
30)  $y = 2 \cos x$



A)

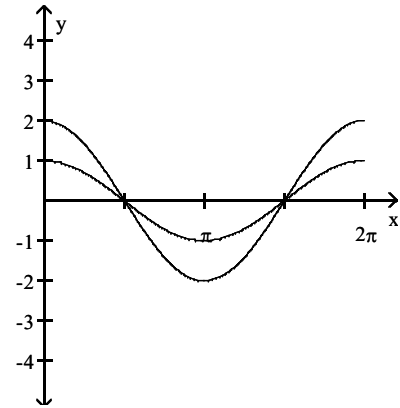


C)

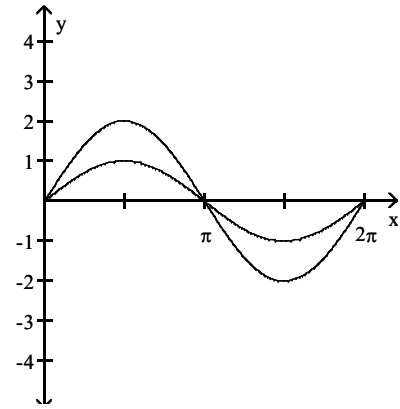


Answer: B

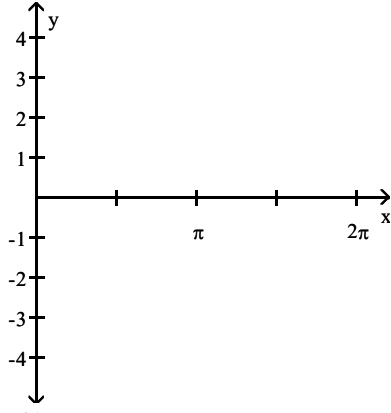
B)



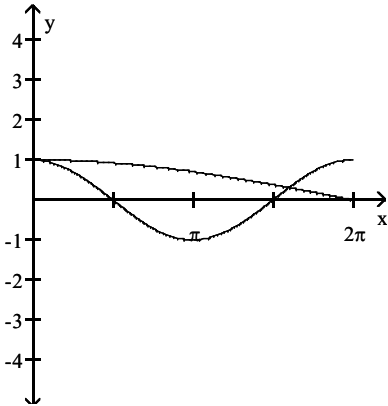
D)



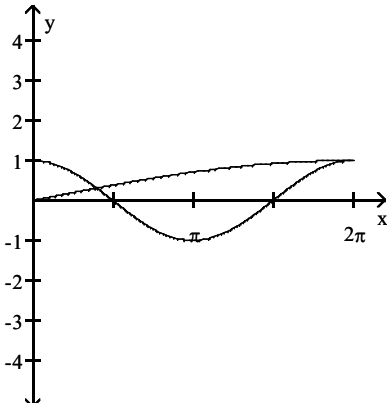
31)  $y = \frac{1}{4} \cos x$



A)

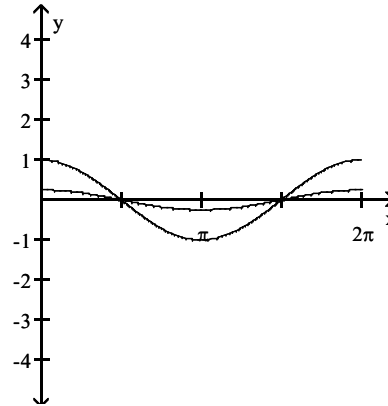


C)

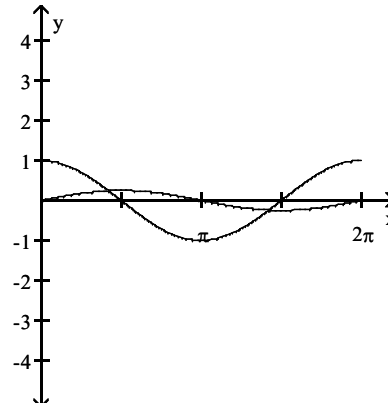


Answer: B

B)



D)



Determine the amplitude or period as requested.

32) Amplitude of  $y = -2 \cos \frac{1}{3}x$

A) 2

B)  $6\pi$

C)  $\frac{\pi}{2}$

D)  $\frac{2\pi}{3}$

Answer: A



33) Amplitude of  $y = \frac{1}{3} \cos 2x$

A)  $6\pi$

B)  $\frac{\pi}{2}$

C)  $\frac{1}{3}$

D) 2

Answer: C

34) Period of  $y = \cos 5x$

A) 5

B)  $2\pi$

C) 1

D)  $\frac{2\pi}{5}$

Answer: D

35) Period of  $y = -5 \cos \frac{1}{4}x$

A)  $\frac{\pi}{4}$

B)  $\frac{5\pi}{4}$

C) -5

D)  $8\pi$

Answer: D

36) Period of  $y = 3 \cos x$

A)  $\frac{\pi}{3}$

B)  $2\pi$

C) 3

D)  $\pi$

Answer: B

37) Period of  $y = \frac{7}{8} \cos \left( -\frac{4\pi}{3}x \right)$

A)  $\frac{8\pi}{3}$

B)  $\frac{4}{7}$

C)  $\frac{3}{2}$

D)  $\frac{7\pi}{4}$

Answer: C

38) Amplitude of  $y = \frac{5}{4} \sin \left( -\frac{4\pi}{3}x \right)$

A)  $\frac{5}{4}$

B)  $\frac{4\pi}{3}$

C)  $\frac{4\pi}{5}$

D)  $\frac{3}{2}$

Answer: A

39) Period of  $y = 9 \cos \left( 7x - \frac{\pi}{2} \right)$

A)  $\frac{7\pi}{2}$

B)  $\frac{2}{7}$

C)  $\frac{7}{2}$

D)  $\frac{2\pi}{7}$

Answer: D

40) Period of  $y = 5 \cos (8\pi x + 4\pi)$

A)  $8\pi$

B) 4

C)  $\frac{1}{4}$

D)  $\frac{\pi}{4}$

Answer: C

**Determine the phase shift of the function.**

41)  $y = -3 \cos \left( x + \frac{\pi}{2} \right)$

A) -3 units up

B) -3 units down

C)  $\frac{\pi}{2}$  units to the left

D)  $\frac{\pi}{2}$  units to the right

Answer: C

42)  $y = -5 \cos (8x + \pi)$

A)  $\frac{\pi}{5}$  units to the left

B)  $5\pi$  units to the right

C)  $8\pi$  units to the right

D)  $\frac{\pi}{8}$  units to the left

Answer: D

43)  $y = -5 \cos \left( \frac{1}{2}x + \frac{\pi}{2} \right)$

A)  $\frac{\pi}{4}$  units to the right

B)  $5\pi$  units to the right

C)  $\pi$  units to the left

D)  $\frac{\pi}{2}$  units to the left

Answer: C

44)  $y = 4 \sin (4\pi x + 3)$

A) 3 units to the left

B)  $\frac{3}{4}$  units to the right

C) 3 units to the right

D)  $\frac{3}{4\pi}$  units to the left

Answer: D

45)  $y = 2 \cos \left( -3x + \frac{\pi}{3} \right)$

A)  $\frac{\pi}{9}$  units to the right

B)  $\frac{\pi}{3}$  units to the left

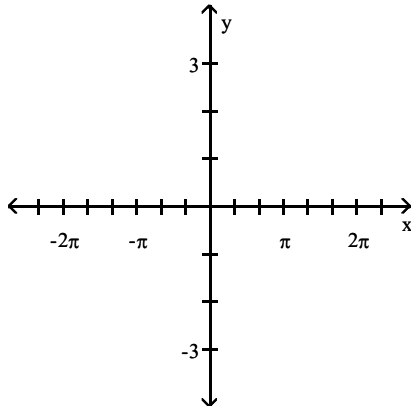
C)  $\frac{\pi}{3}$  units to the right

D)  $\frac{\pi}{9}$  units to the left

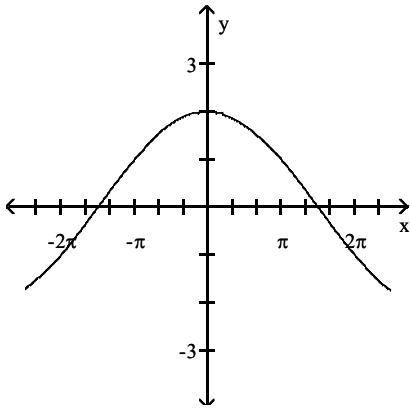
Answer: A

**Graph the function.**

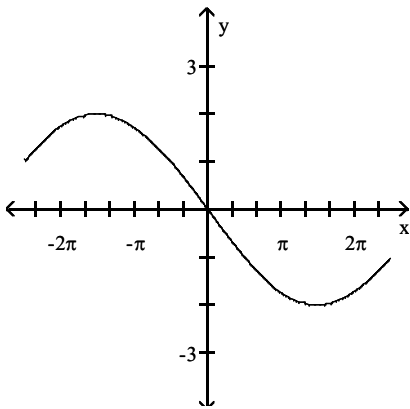
46)  $y = 2 \cos 3x$



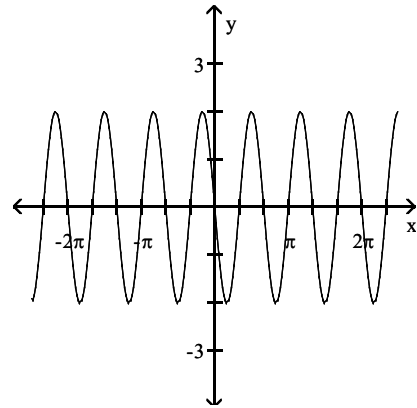
A)



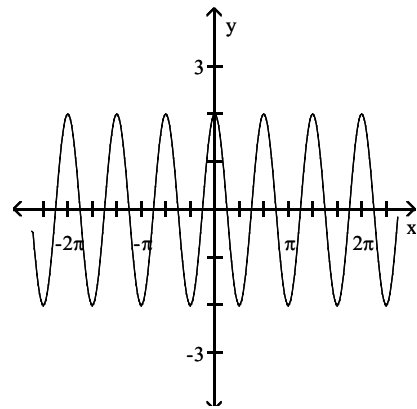
C)



B)

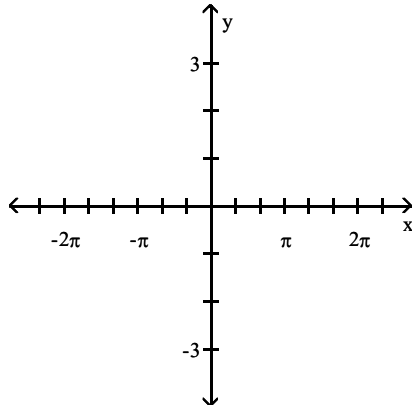


D)

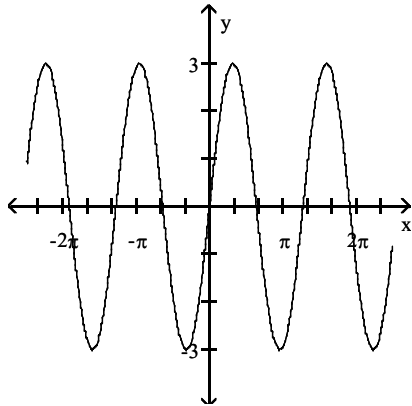


Answer: D

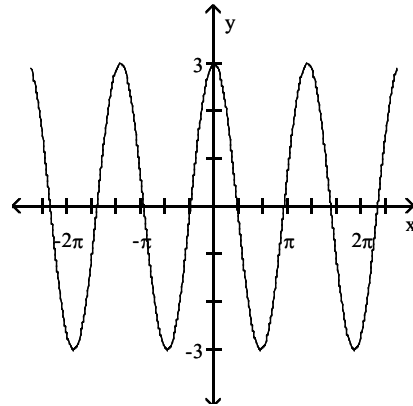
47)  $y = 3 \cos \frac{1}{2}x$



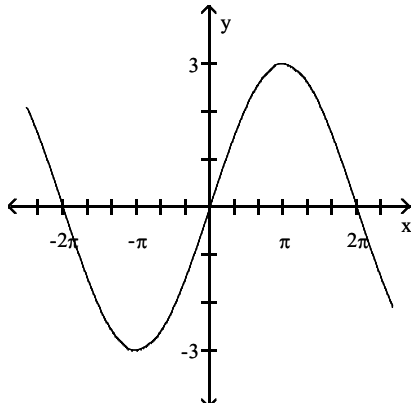
A)



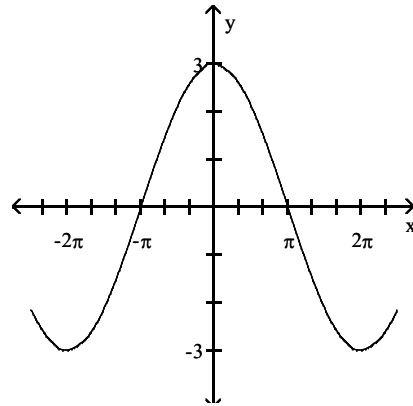
B)



C)

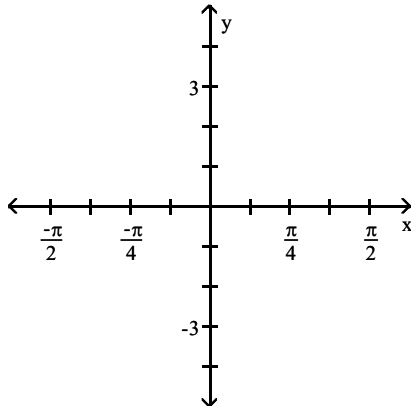


D)

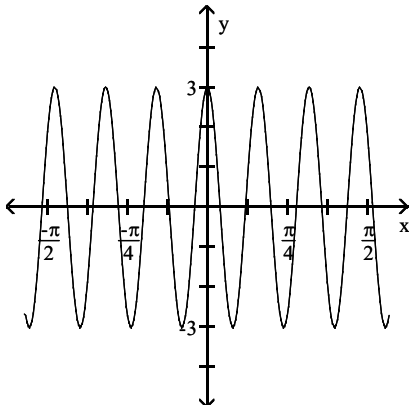


Answer: D

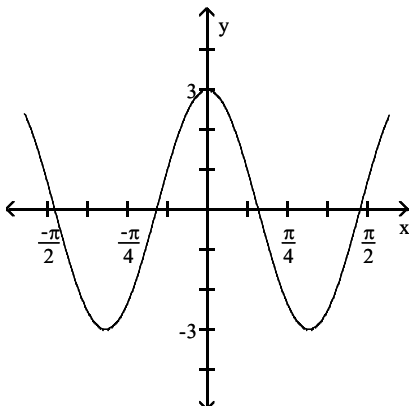
48)  $y = 3 \cos 4\pi x$



A)

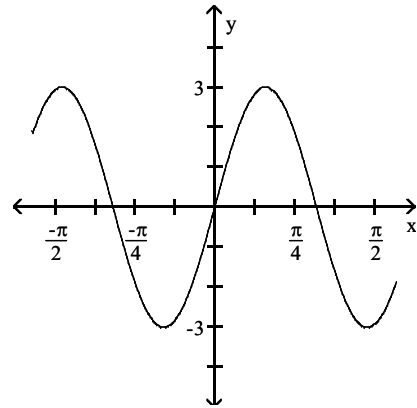


C)

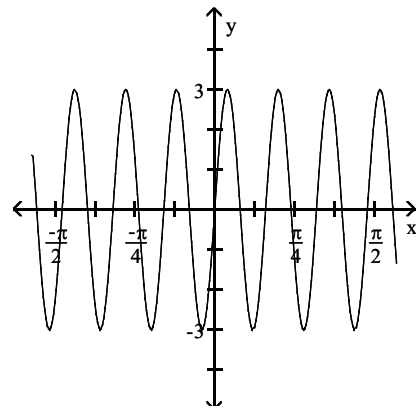


Answer: A

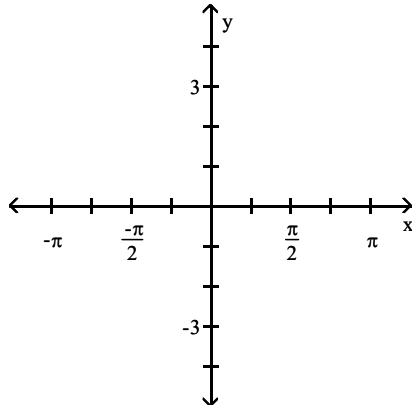
B)



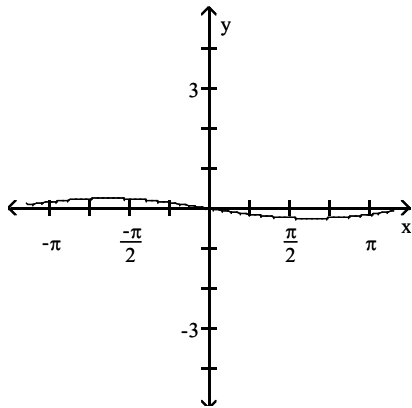
D)



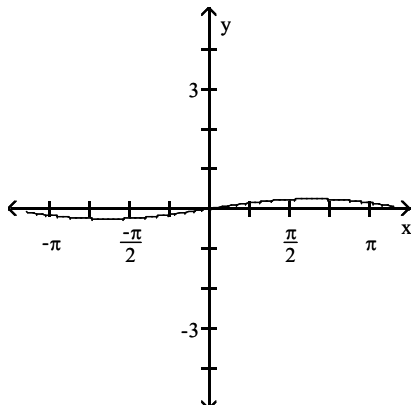
49)  $y = -\frac{1}{4} \cos \frac{\pi}{4}x$



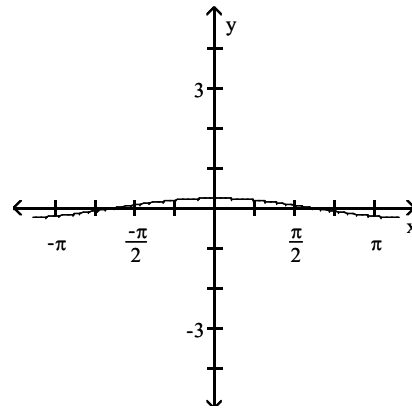
A)



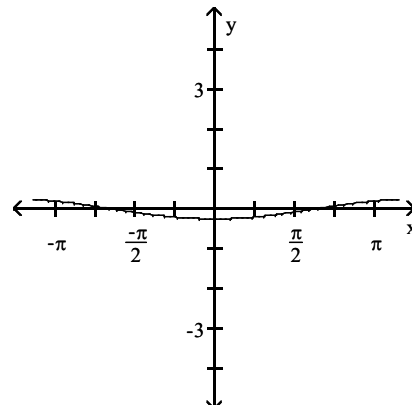
C)



B)

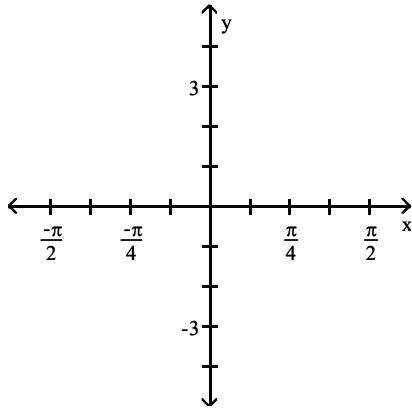


D)

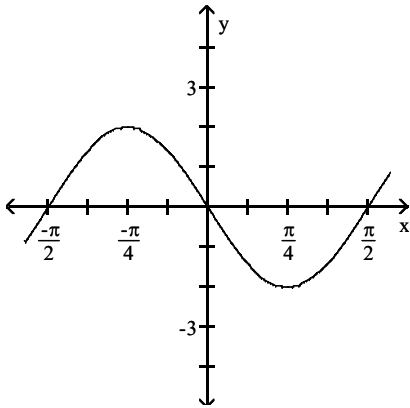


Answer: D

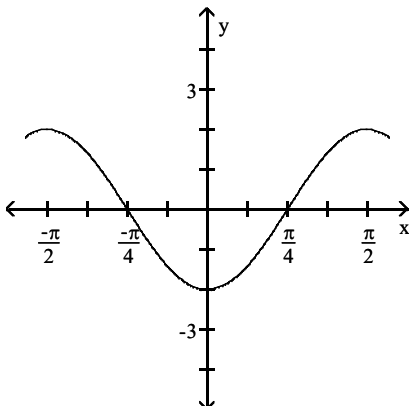
50)  $y = -2 \cos(2x - \pi)$



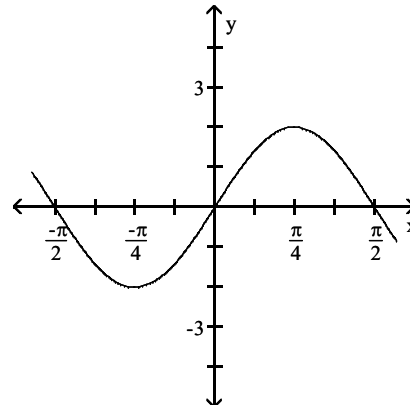
A)



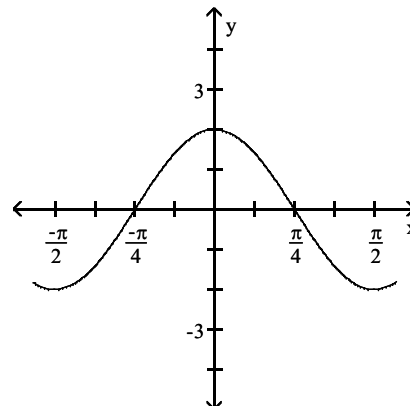
C)



B)

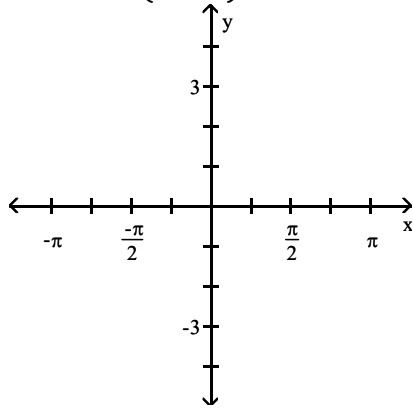


D)

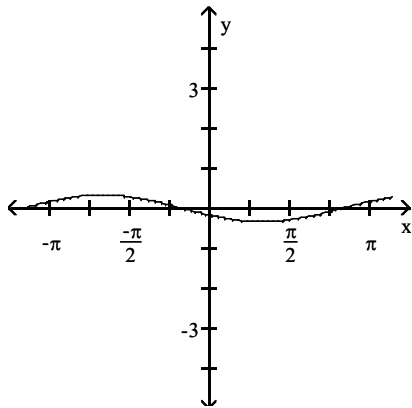


Answer: D

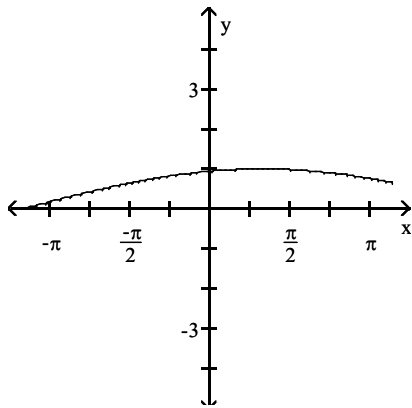
$$51) y = -\frac{1}{3} \cos\left(2x + \frac{\pi}{3}\right)$$



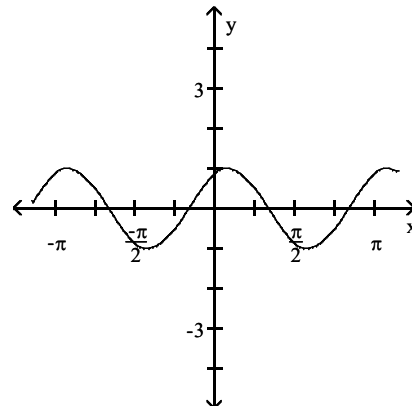
A)



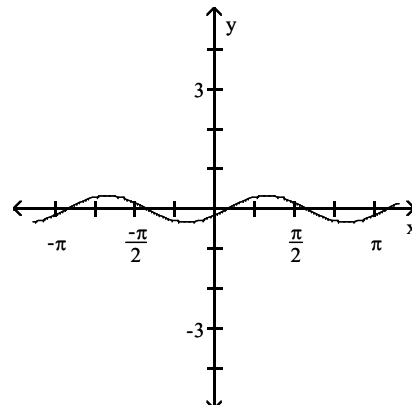
C)



B)



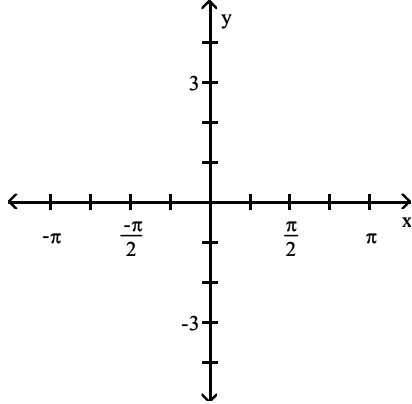
D)



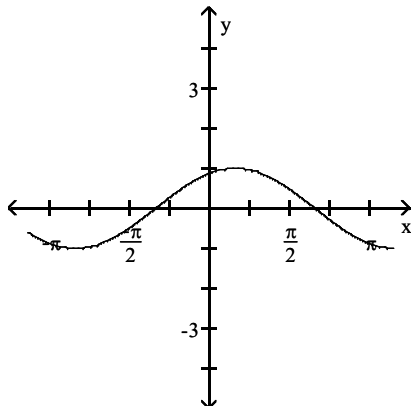
Answer: D



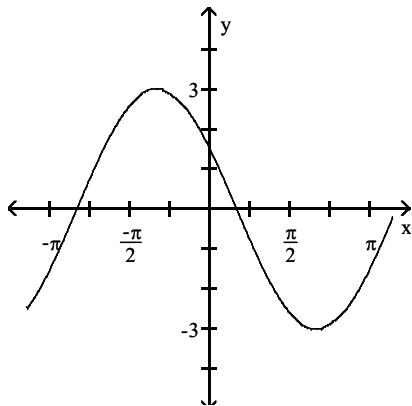
52)  $y = 3 \cos\left(x + \frac{\pi}{3}\right)$



A)

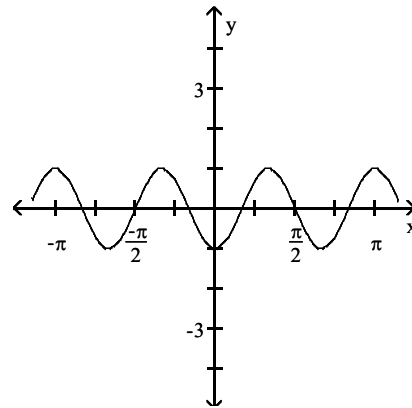


C)

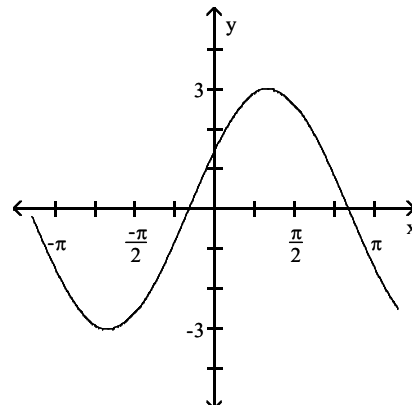


Answer: C

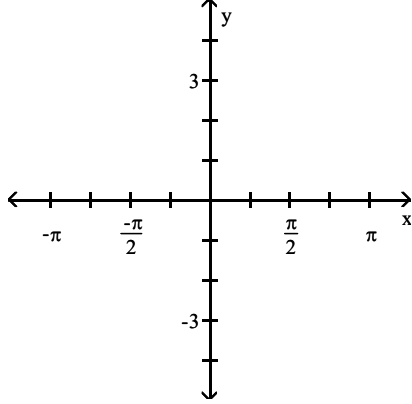
B)



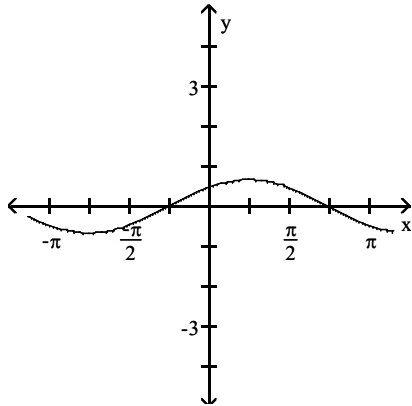
D)



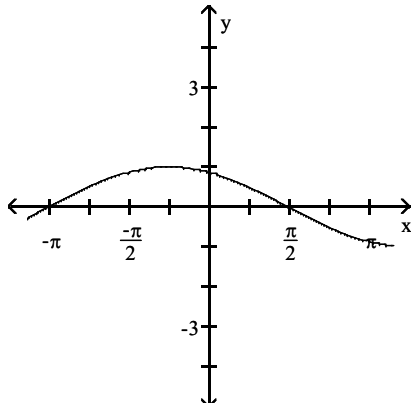
$$53) y = \frac{2}{3} \cos\left(x - \frac{\pi}{4}\right)$$



A)

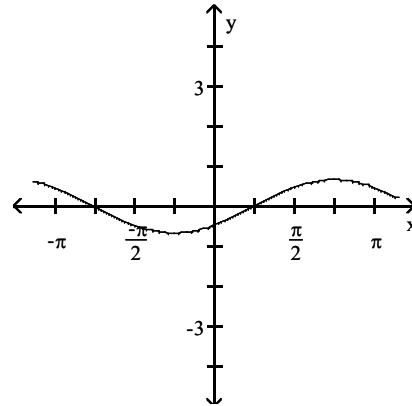


C)

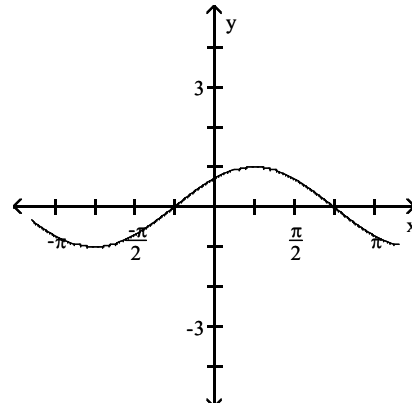


Answer: A

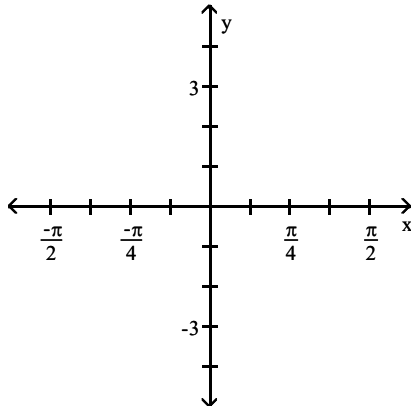
B)



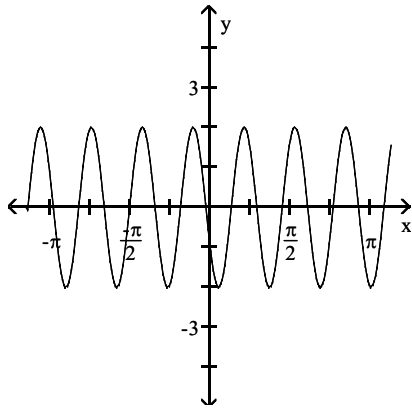
D)



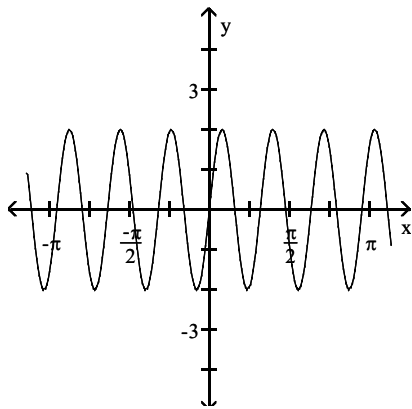
54)  $y = -2 \cos(2\pi x + 2\pi)$



A)

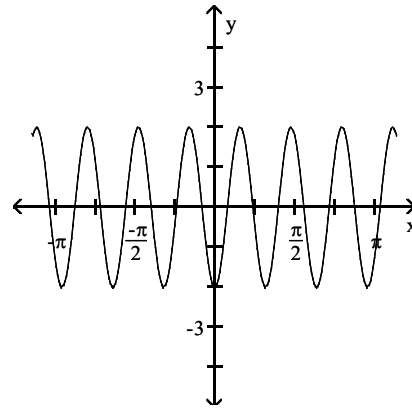


C)

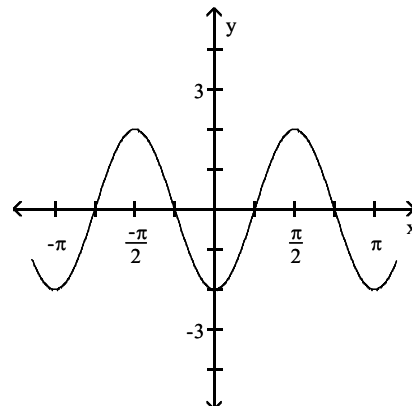


Answer: B

B)

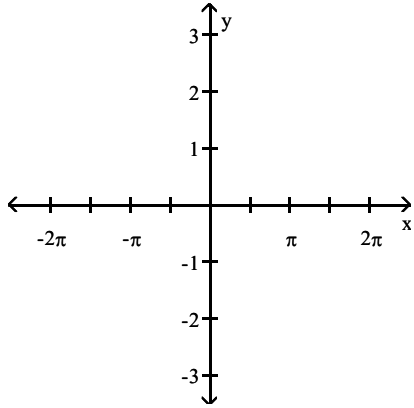


D)

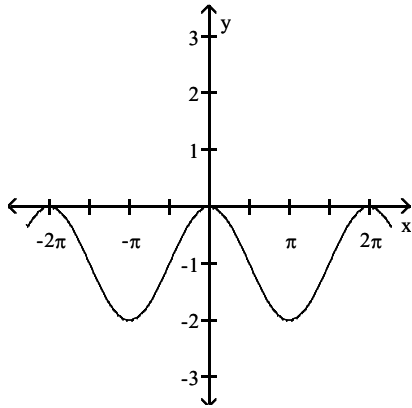


Use a vertical shift to graph the function.

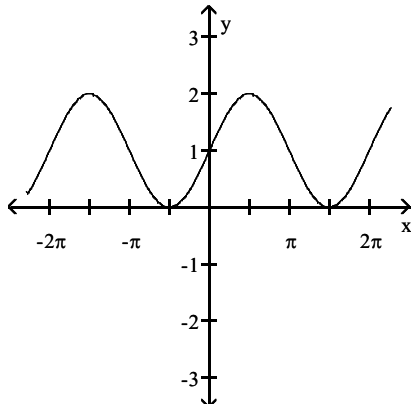
55)  $y = 1 + \sin x$



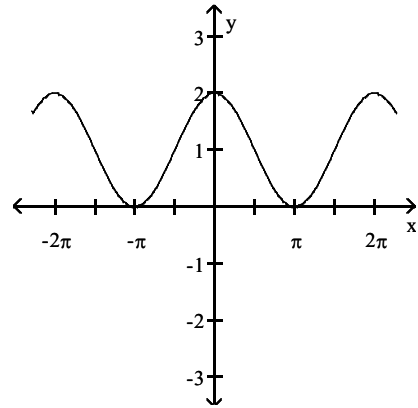
A)



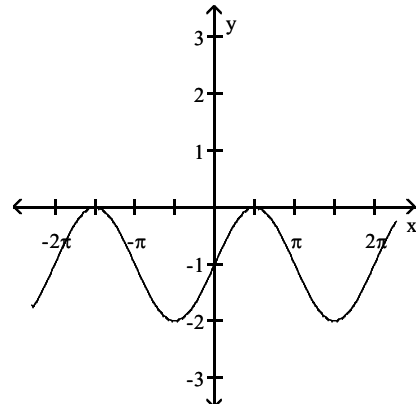
C)



B)

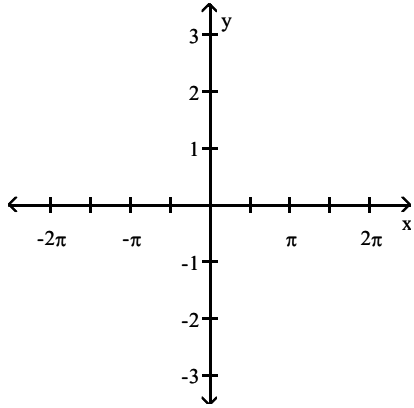


D)

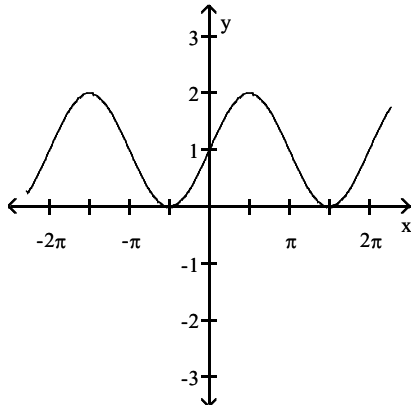


Answer: C

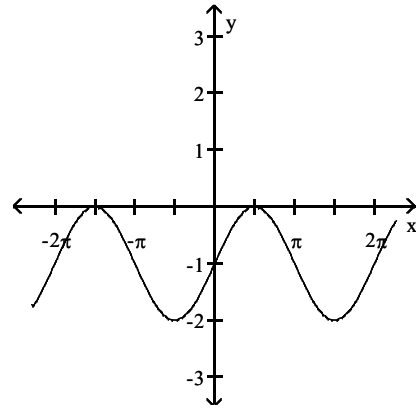
56)  $y = 1 + \cos x$



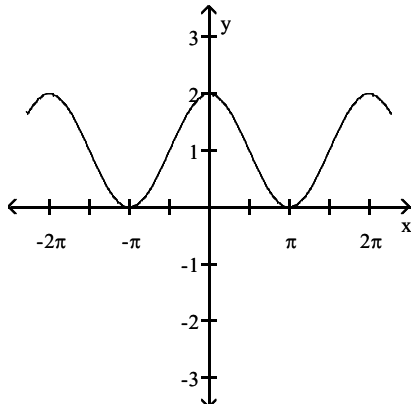
A)



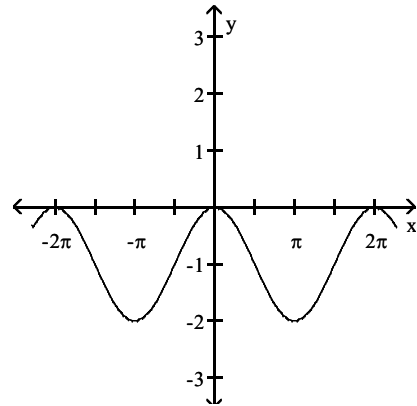
B)



C)

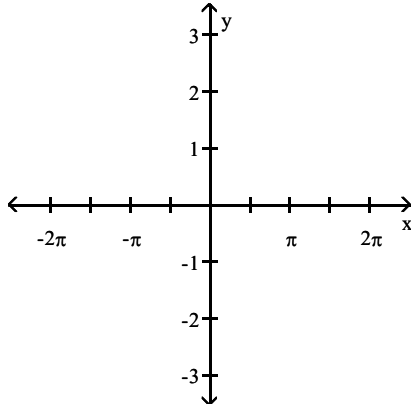


D)

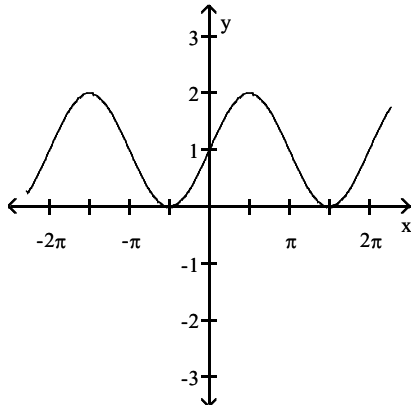


Answer: C

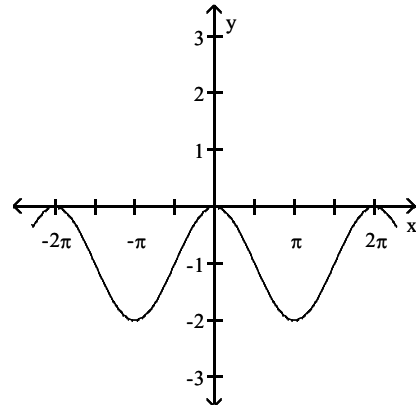
57)  $y = \sin x - 1$



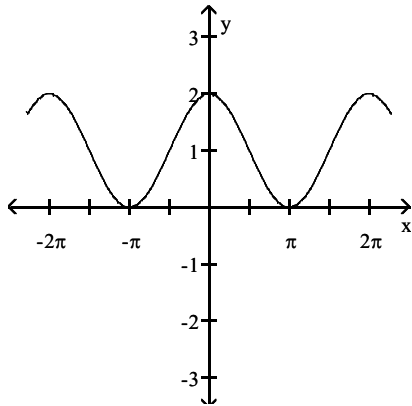
A)



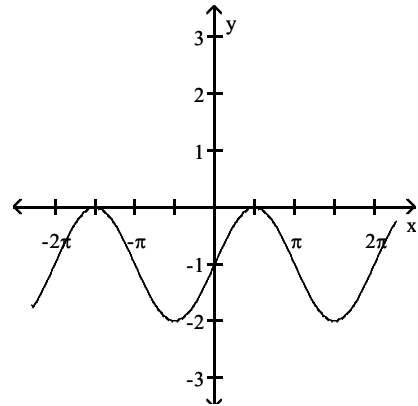
B)



C)

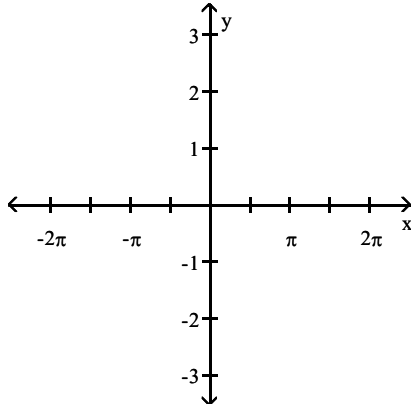


D)

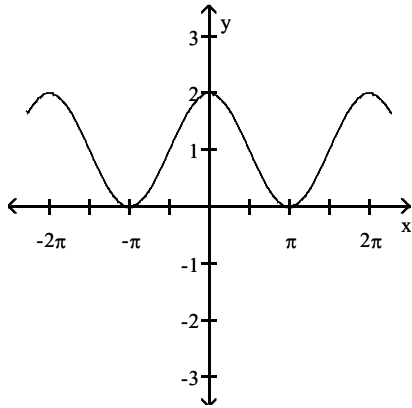


Answer: D

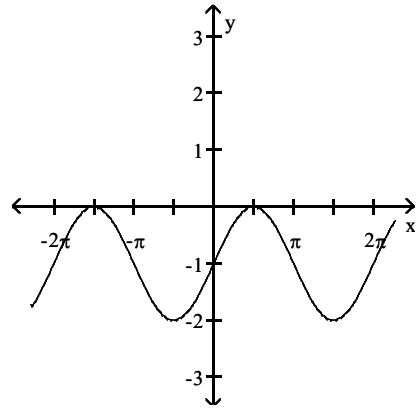
58)  $y = \cos x - 1$



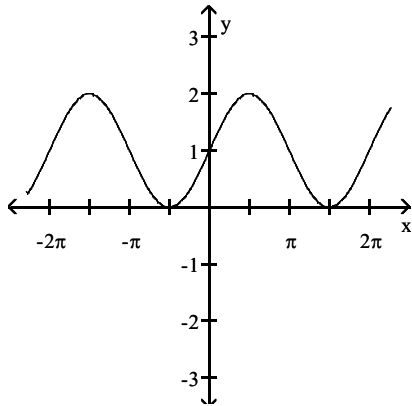
A)



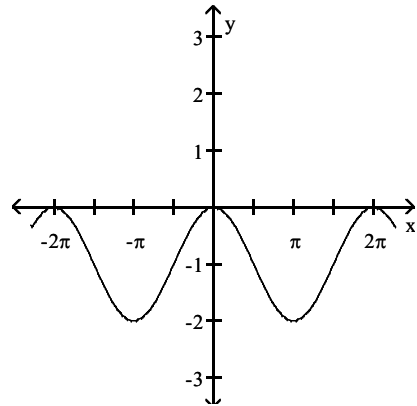
B)



C)

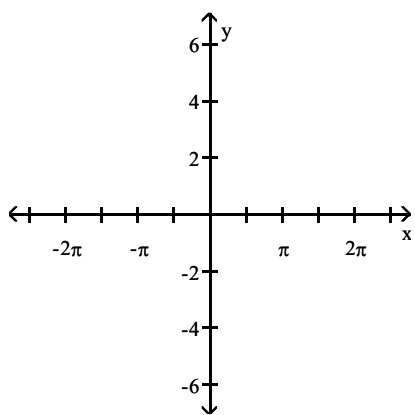


D)

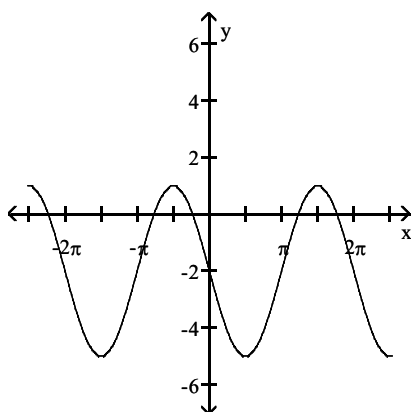


Answer: D

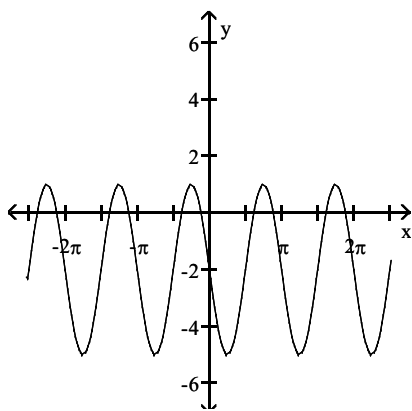
59)  $y = -3 \sin \frac{1}{2}x - 2$



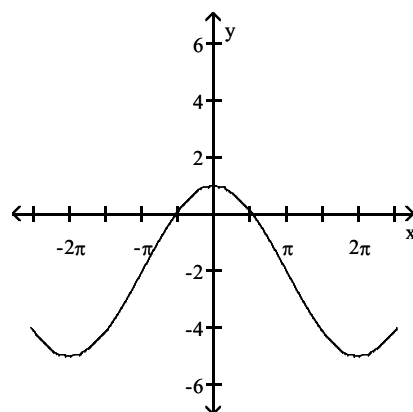
A)



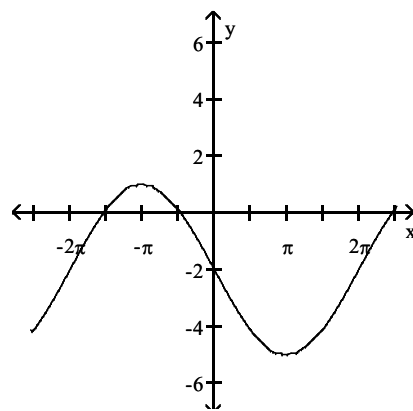
C)



B)



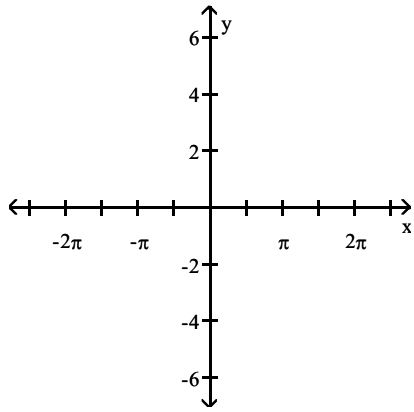
D)



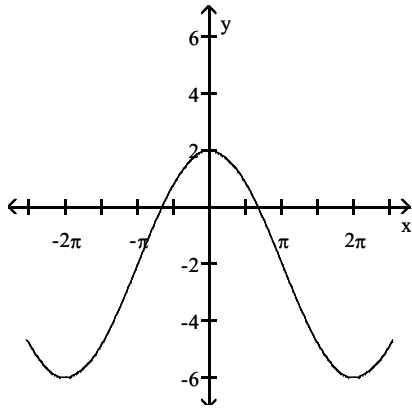
Answer: D



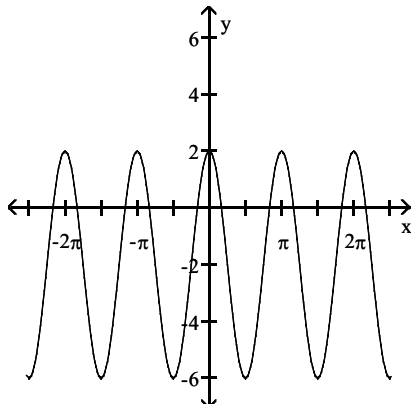
60)  $y = 4 \cos \frac{1}{2}x - 2$



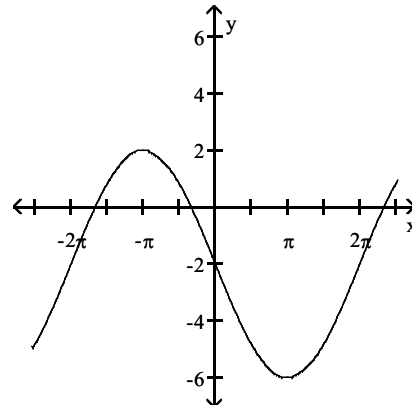
A)



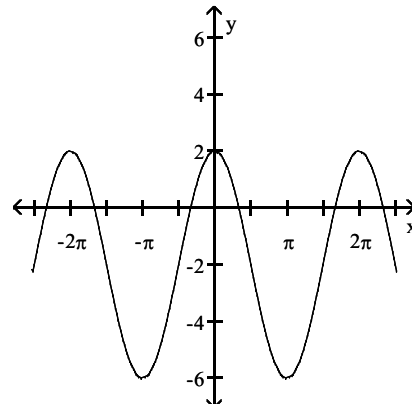
C)



B)

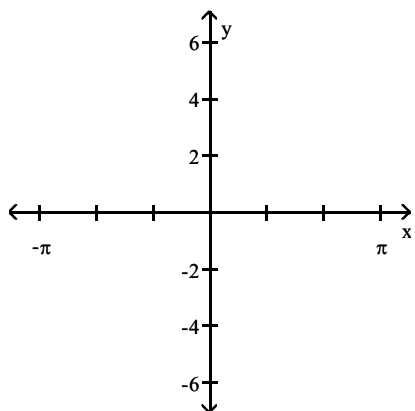


D)

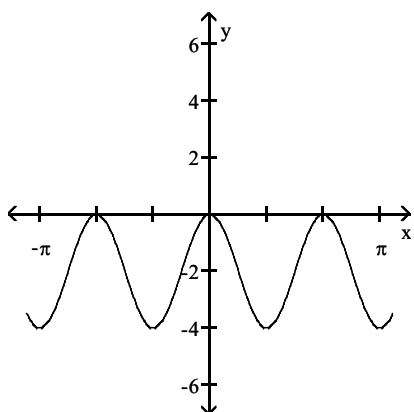


Answer: A

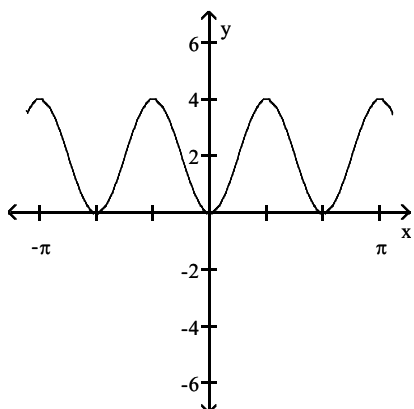
$$61) y = -2 \sin\left(3x + \frac{\pi}{2}\right) - 2$$



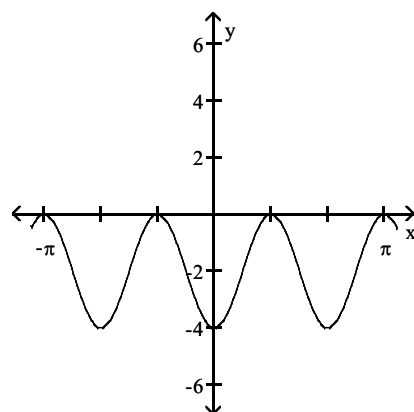
A)



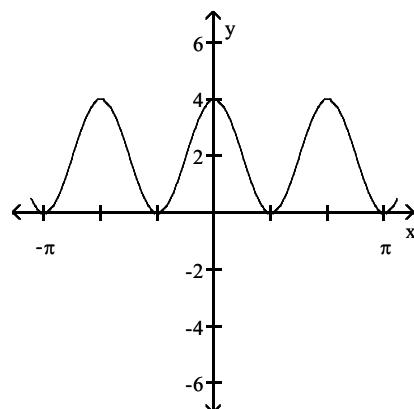
C)



B)

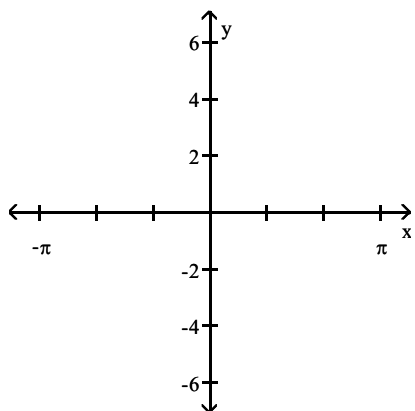


D)

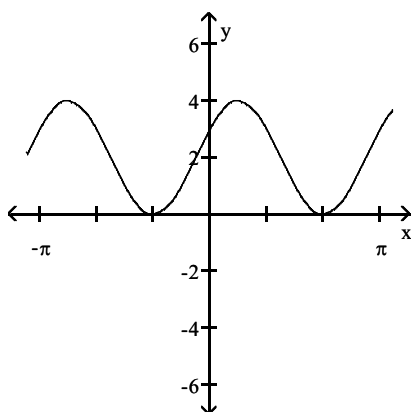


Answer: B

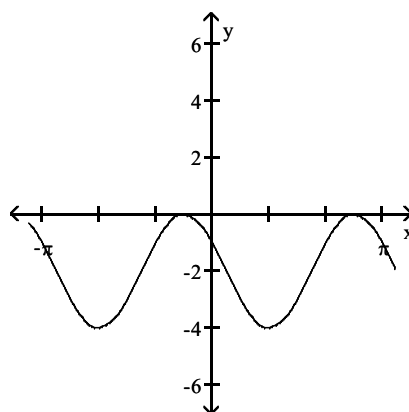
$$62) y = 2 \cos\left(2x - \frac{\pi}{3}\right) + 2$$



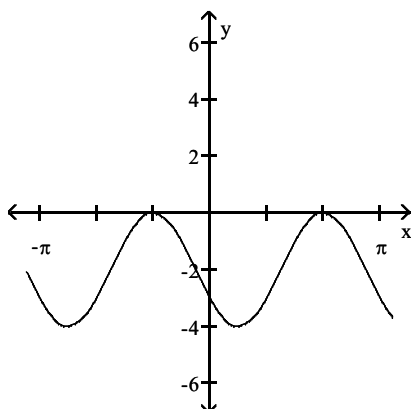
A)



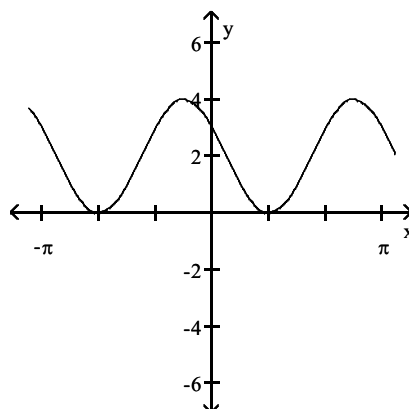
B)



C)



D)



Answer: A

**Solve the problem.**

63) An experiment in a wind tunnel generates cyclic waves. The following data is collected for 44 seconds:

Time (in seconds)	Wind speed (in feet per second)
0	21
11	43
22	65
33	43
44	21

Let  $V$  represent the wind speed (velocity) in feet per second and let  $t$  represent the time in seconds. Write a sine equation that describes the wave.

A)  $V = 44 \sin(44t - 22) + 22$

B)  $V = 65 \sin(44t - 22) + 21$

C)  $V = 22 \sin\left(\frac{\pi}{22}t - \frac{\pi}{2}\right) + 43$

D)  $V = 65 \sin\left(\frac{\pi}{22}t - \frac{\pi}{2}\right) + 21$

Answer: C

64) The current  $I$ , in amperes, flowing through a particular ac (alternating current) circuit at time  $t$  seconds is

$$I = 220 \sin\left(25\pi t - \frac{\pi}{6}\right)$$

What is the period of the current?

A)  $\frac{1}{150}$  second

B)  $25\pi$  seconds

C)  $\frac{\pi}{220}$  second

D)  $\frac{2}{25}$  second

Answer: D

65) The total sales in dollars of some small businesses fluctuates according to the equation  $S = A + B \sin \frac{\pi}{6}x$ , where  $x$  is the time in months, with  $x = 1$  corresponding to January,  $A = 6100$ , and  $B = 3100$ . Determine the month with the greatest total sales and give the sales in that month.

A) December; \$9200

B) September; \$3000

C) March; \$9200

D) June; \$6100

Answer: C

66) Tides go up and down in a 12.8-hour period. The average depth of a certain river is 10 m and ranges from 7 to 13 m. The variation can be approximated by a sine curve. Write an equation that gives the approximate variation  $y$ , if  $x$  is the number of hours after midnight and high tide occurs at 6:00 am.

A)  $y = 10 \sin\left(\frac{\pi x}{6.4} - 6\pi\right) + 3$

B)  $y = 10 \sin\left(\frac{\pi x}{6.4} - \frac{6\pi}{6.4}\right) + 3$

C)  $y = 3 \sin\left(\frac{\pi x}{6.4} - \frac{6\pi}{6.4}\right) + 10$

D)  $y = 3 \sin\left(\frac{\pi x}{6.4} - \frac{2.8\pi}{6.4}\right) + 10$

Answer: D

67) Suppose that the average monthly low temperatures for a small town are shown in the table.

Month	1	2	3	4	5	6	7	8	9	10	11	12
Temperature (°F)	19	27	38	45	57	62	65	58	51	41	33	25

Model this data using  $f(x) = a \sin(b(x - c)) + d$ . Use the sine regression feature to do this. Approximate all values to one decimal place.

A)  $f(x) = 25.7 \sin(0.5(x + 1.6)) + 32.5$

B)  $f(x) = 22.5 \sin(1.25(x + 1.6)) + 40.7$

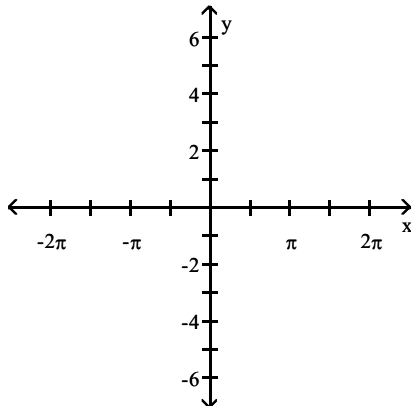
C)  $f(x) = 22.5 \sin(0.5(x + 3.2)) + 40.7$

D)  $f(x) = 22.5 \sin(0.5(x + 1.6)) + 40.7$

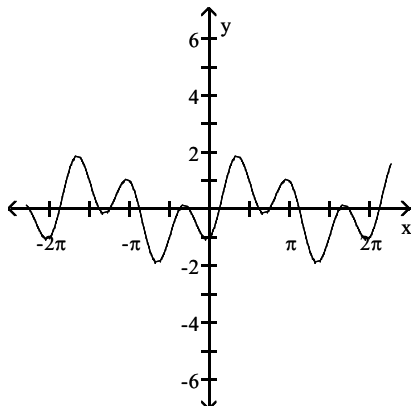
Answer: D

**Graph the function.**

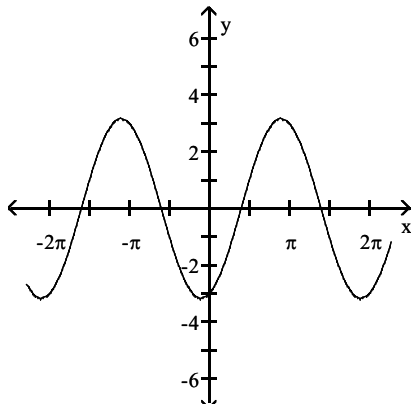
68)  $y = \sin x - 3 \cos x$



A)

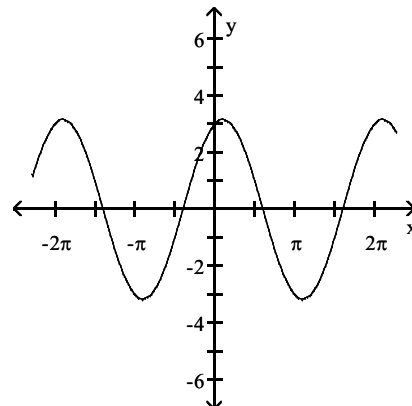


C)

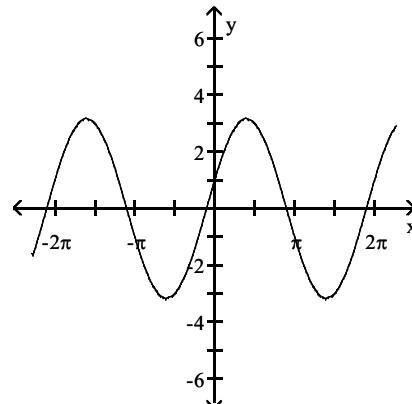


Answer: C

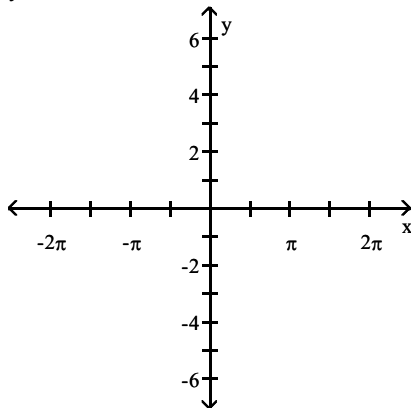
B)



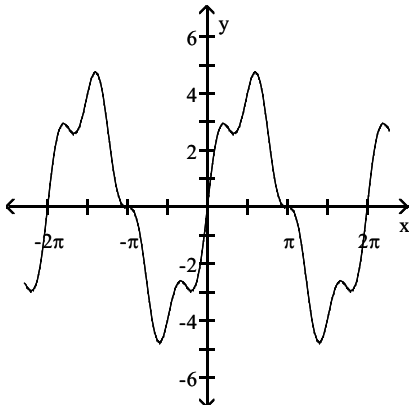
D)



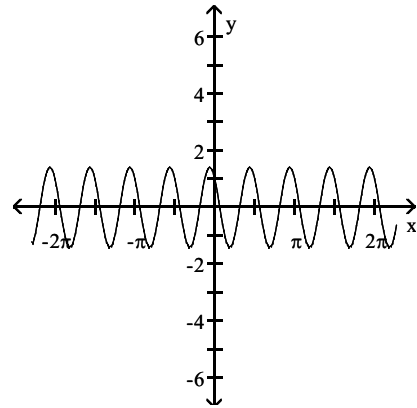
69)  $y = 4 \cos x - \sin 4x$



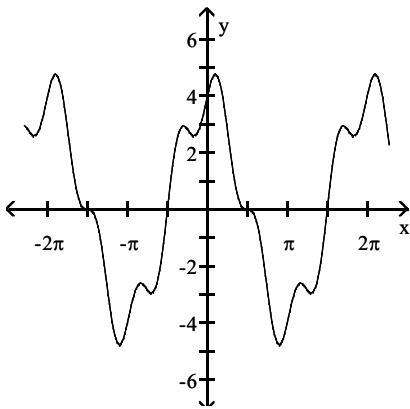
A)



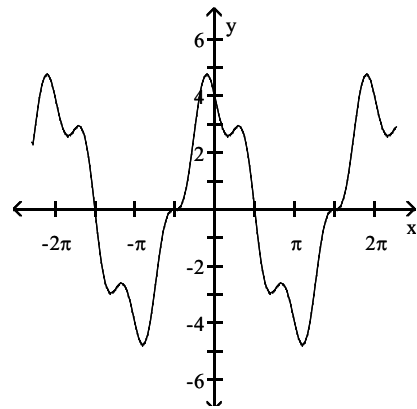
B)



C)



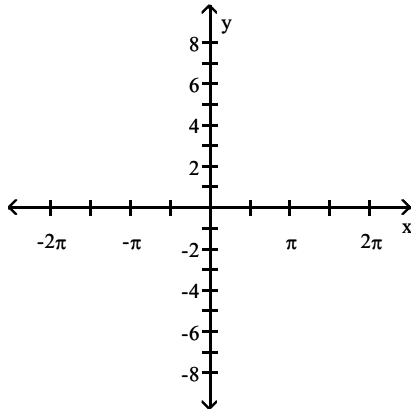
D)



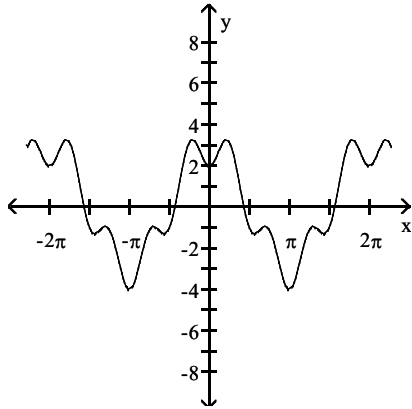
Answer: D

Use the method of adding y-coordinates to graph the function.

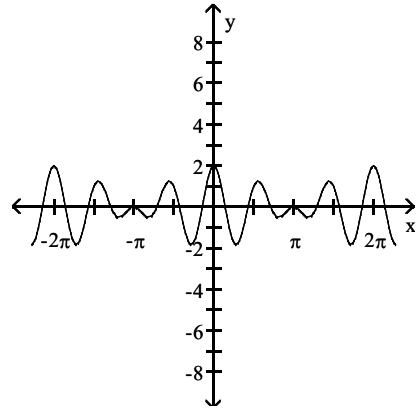
70)  $y = 3 \cos x + \cos 4x$



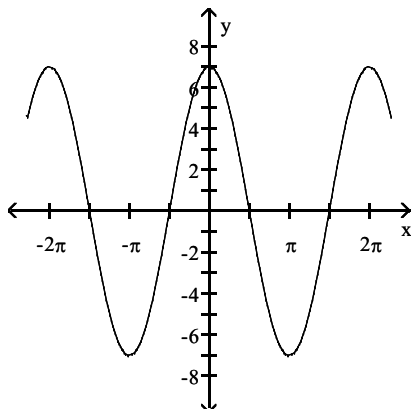
A)



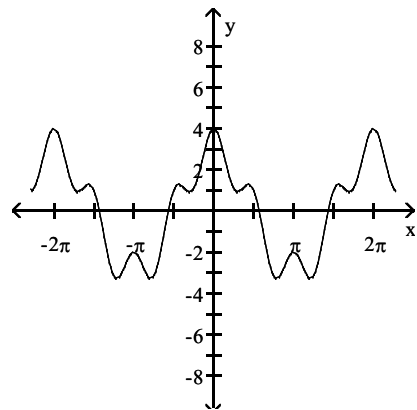
B)



C)

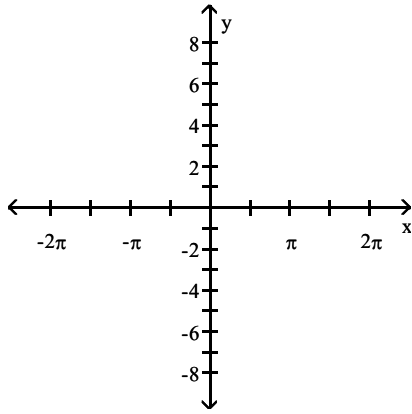


D)

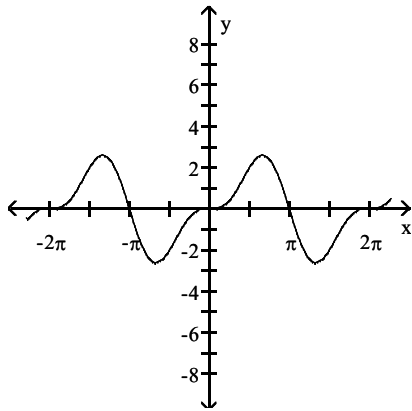


Answer: D

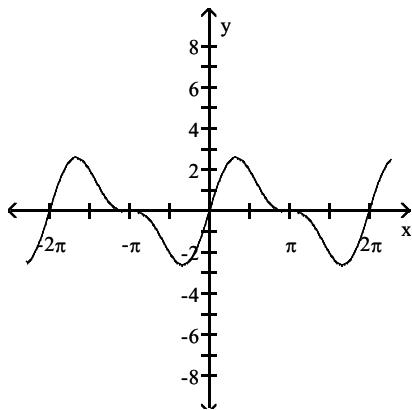
71)  $y = 2 \sin x + \sin 2x$



A)

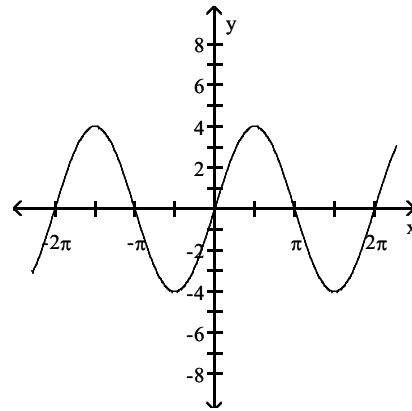


C)

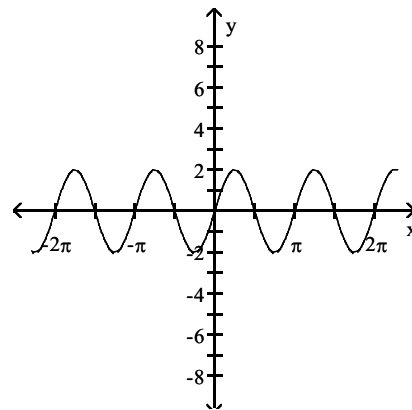


Answer: C

B)



D)



**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

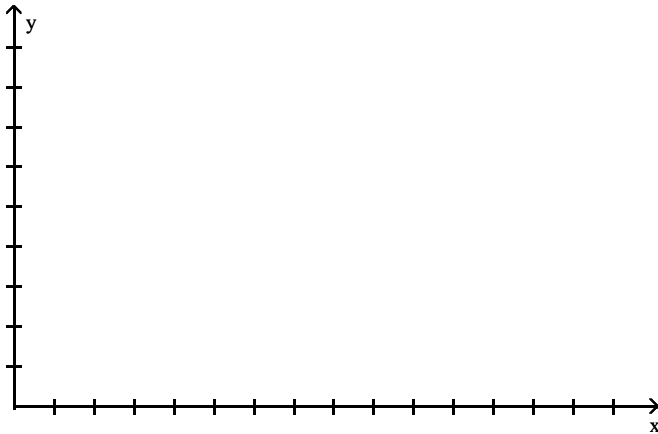
**Solve the problem.**



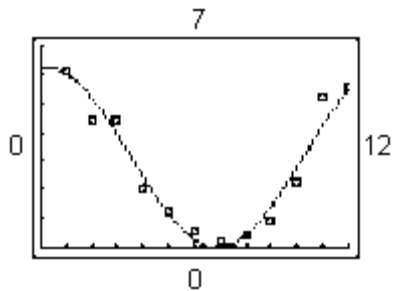
72) The following data represents the normal monthly precipitation for a certain city.

Month, $x$	Normal Monthly Precipitation, inches
January, 1	6.06
February, 2	4.45
March, 3	4.38
April, 4	2.08
May, 5	1.27
June, 6	0.56
July, 7	0.17
August, 8	0.46
September, 9	0.91
October, 10	2.24
November, 11	5.21
December, 12	5.51

Draw a scatter diagram of the data for one period. Find a sinusoidal function of the form  $y = A \sin(\omega x - \varphi) + B$  that fits the data. Draw the sinusoidal function on the scatter diagram. Use a graphing utility to find the sinusoidal function of best fit. Draw the sinusoidal function of best fit on the scatter diagram.



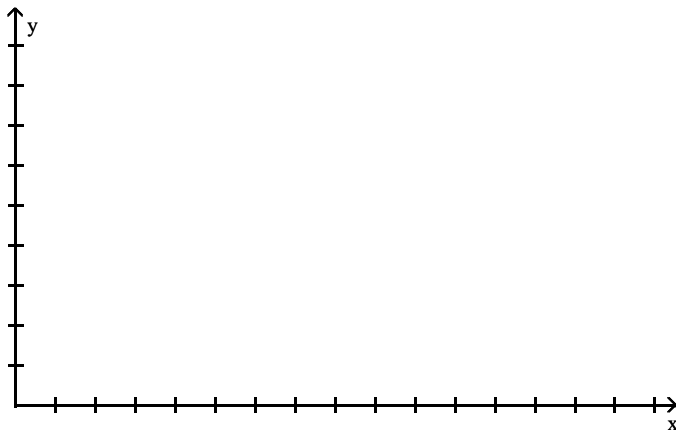
Answer:  $y = 3.14 \sin(0.46x + 1.53) + 3.16$ ;



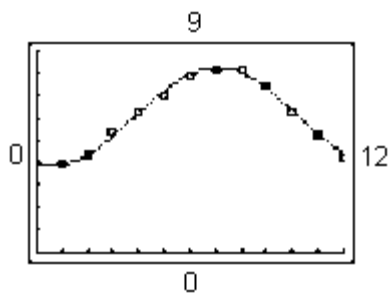
73) The following data represents the normal monthly precipitation for a certain city.

Month, $x$	Normal Monthly Precipitation, inches
January, 1	3.91
February, 2	4.36
March, 3	5.31
April, 4	6.21
May, 5	7.02
June, 6	7.84
July, 7	8.19
August, 8	8.06
September, 9	7.41
October, 10	6.30
November, 11	5.21
December, 12	4.28

Draw a scatter diagram of the data for one period. Find the sinusoidal function of the form  $y = A \sin(\omega x - \phi) + B$  that fits the data. Draw the sinusoidal function on the scatter diagram. Use a graphing utility to find the sinusoidal function of best fit. Draw the sinusoidal function of best fit on the scatter diagram.



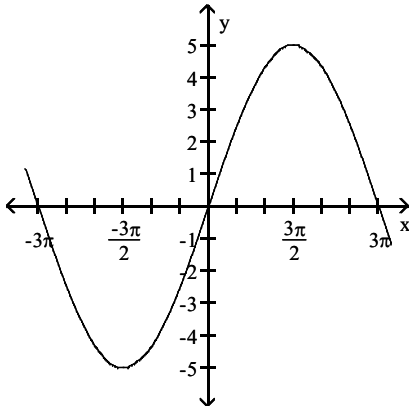
Answer:  $y = 2.17 \sin(0.49x - 1.88) + 6.02$ ;



**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

Find an equation for the graph.

74)



A)  $y = 3 \sin 5x$

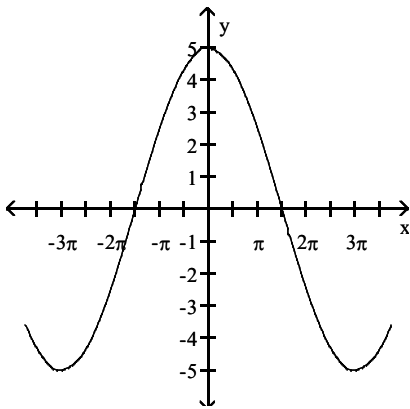
B)  $y = 3 \sin \frac{1}{5}x$

C)  $y = 5 \sin 3x$

D)  $y = 5 \sin \frac{1}{3}x$

Answer: D

75)



A)  $y = 5 \cos \frac{1}{3}x$

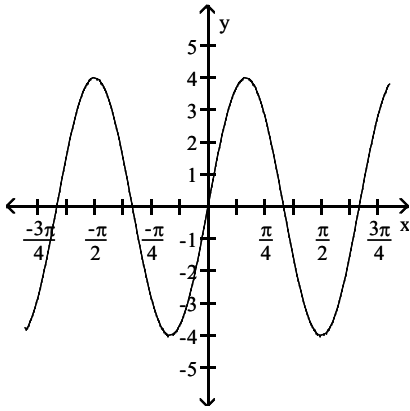
B)  $y = 3 \cos 5x$

C)  $y = 5 \cos 3x$

D)  $y = 3 \cos \frac{1}{5}x$

Answer: A

76)



A)  $y = 4 \sin 3x$

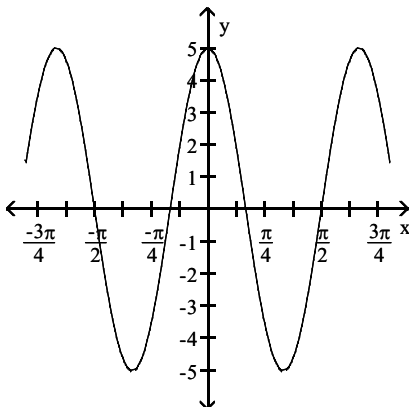
B)  $y = 3 \sin 4x$

C)  $y = 4 \sin \frac{1}{3}x$

D)  $y = 3 \sin \frac{1}{4}x$

Answer: A

77)



A)  $y = 5 \cos \frac{1}{3}x$

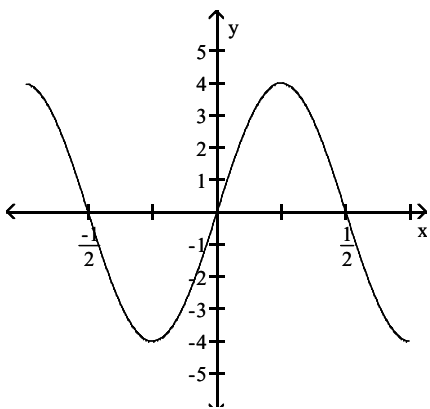
B)  $y = 3 \cos 5x$

C)  $y = 5 \cos 3x$

D)  $y = 3 \cos \frac{1}{5}x$

Answer: C

78)



A)  $y = 2 \sin 4\pi x$

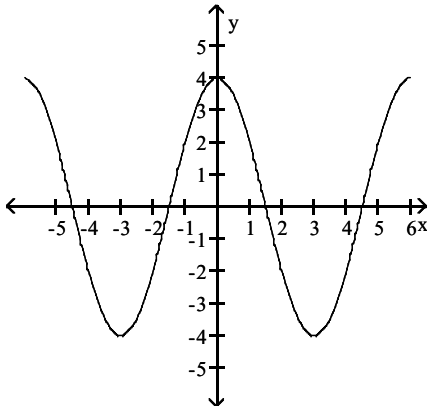
B)  $y = 4 \sin \frac{\pi}{2}x$

C)  $y = 4 \sin 2\pi x$

D)  $y = 2 \sin \frac{\pi}{4}x$

Answer: C

79)



A)  $y = 3 \cos 4\pi x$

B)  $y = 3 \cos \frac{\pi}{4}x$

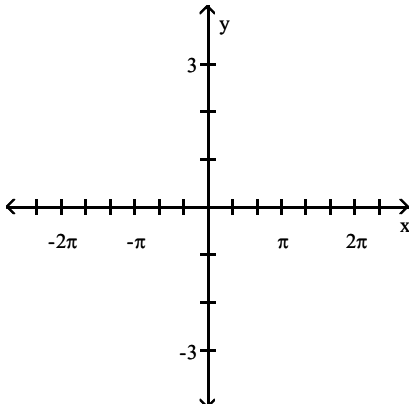
C)  $y = 4 \cos \frac{\pi}{3}x$

D)  $y = 4 \cos 3\pi x$

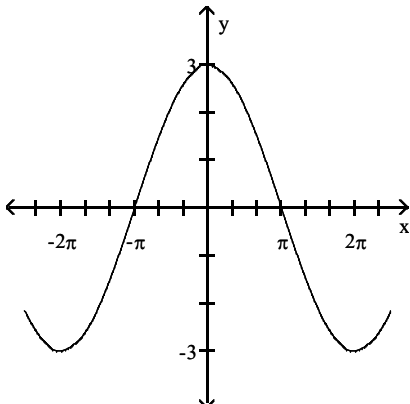
Answer: C

Graph the function.

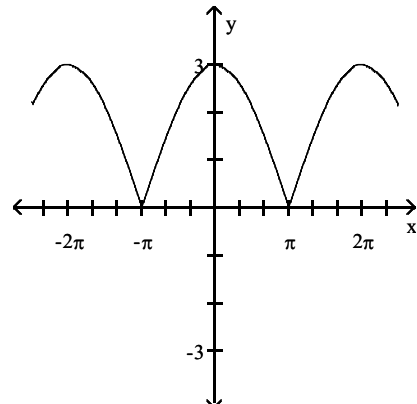
80)  $y = \left| -3 \cos \frac{1}{2}x \right|$



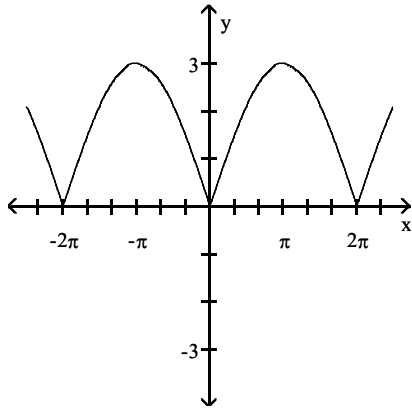
A)



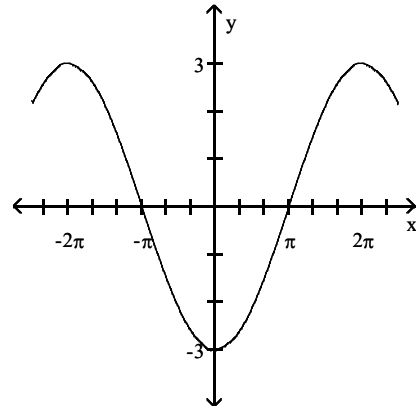
B)



C)

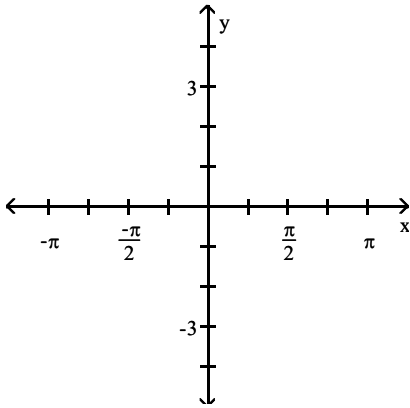


D)

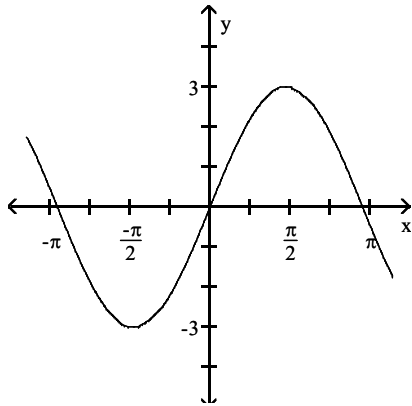


Answer: B

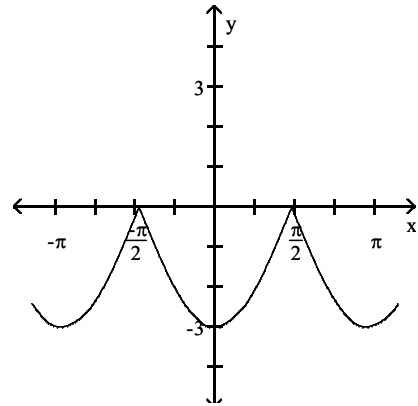
$$81) y = -\left| 3 \sin \frac{\pi x}{3} \right|$$



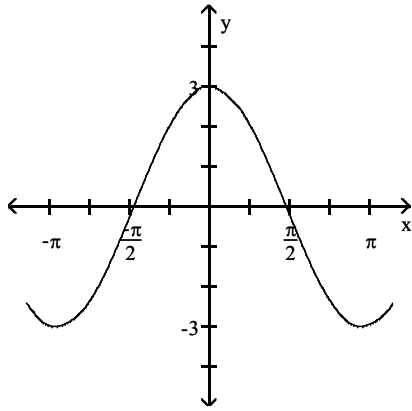
A)



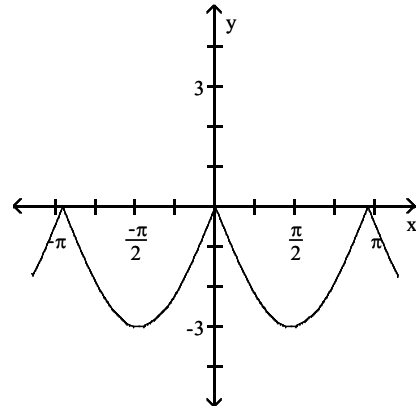
B)



C)



D)

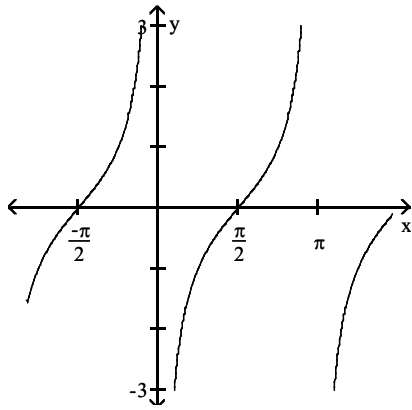


Answer: D

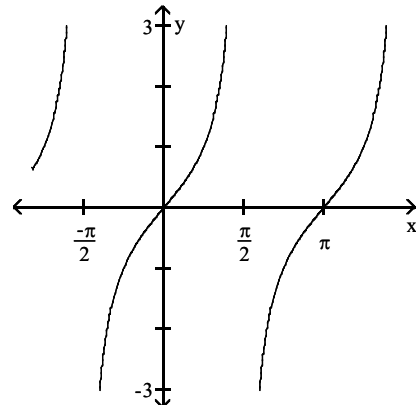
Match the function to its graph.

82)  $y = -\tan x$

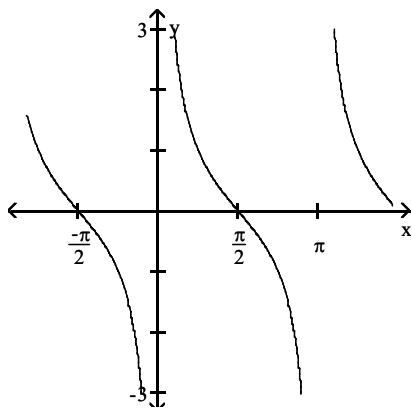
A)



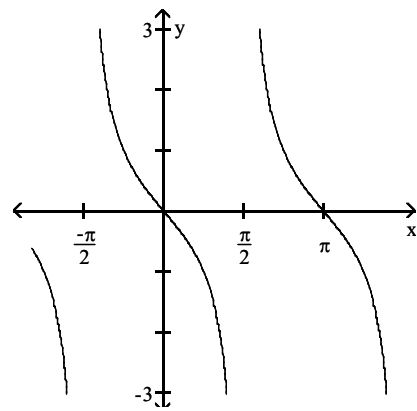
B)



C)



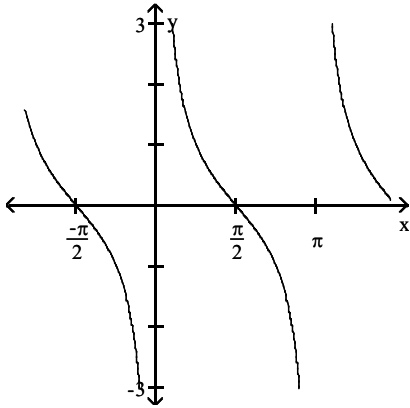
D)



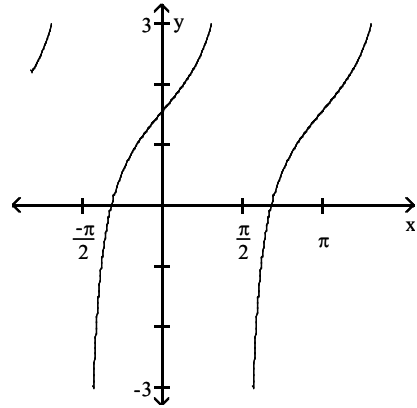
Answer: D

83)  $y = \tan\left(x + \frac{\pi}{2}\right)$

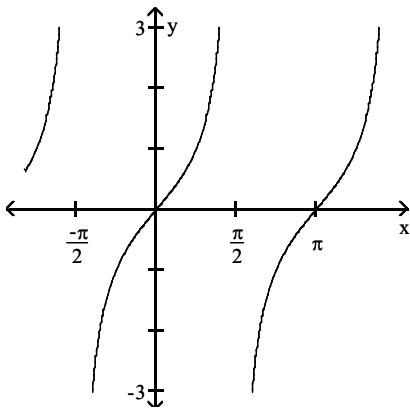
A)



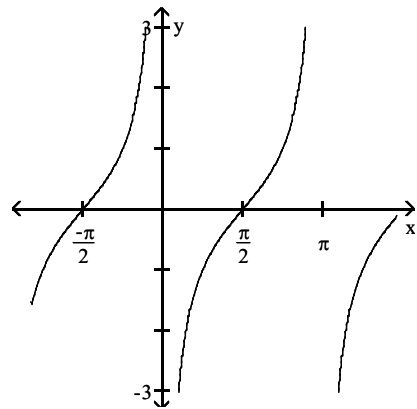
B)



C)



D)

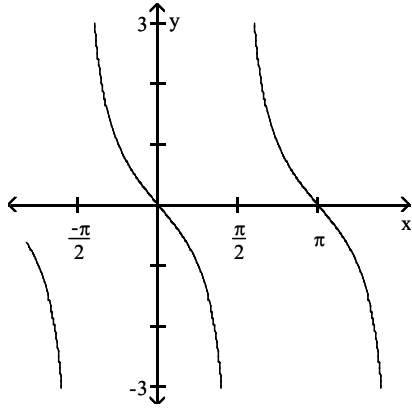


Answer: D

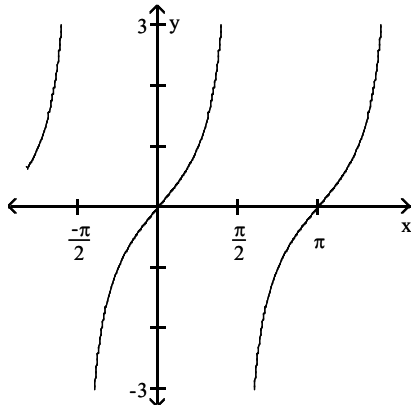


84)  $y = -\tan(x + \pi)$

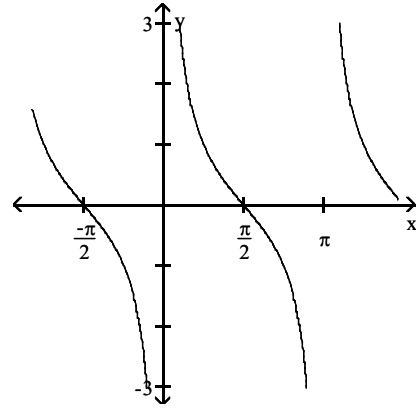
A)



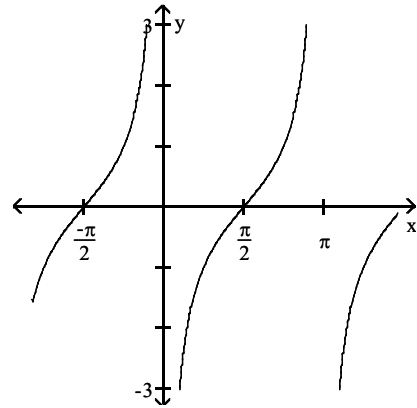
C)



B)



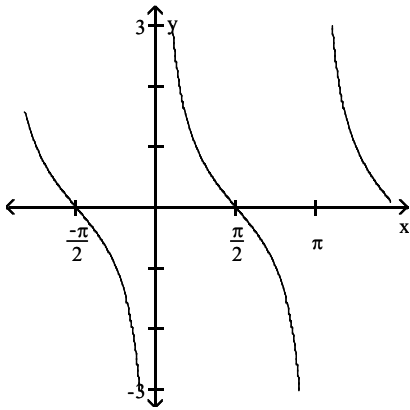
D)



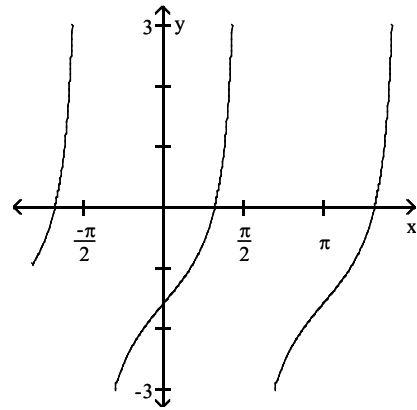
Answer: A

85)  $y = \tan\left(x - \frac{\pi}{2}\right)$

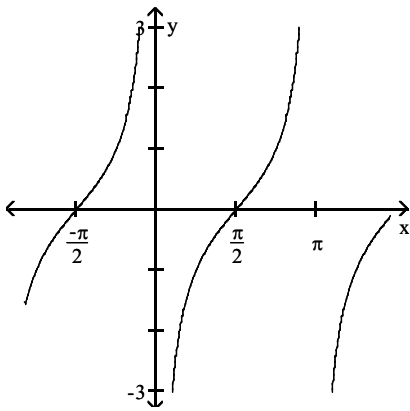
A)



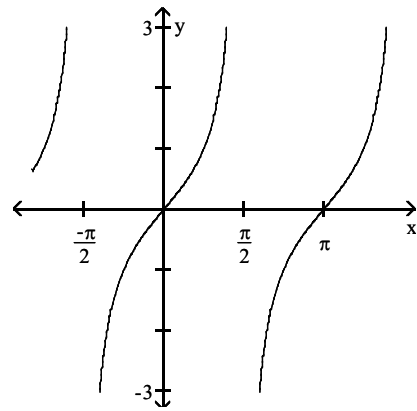
B)



C)



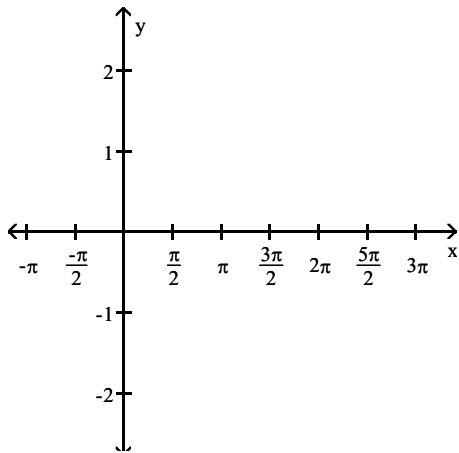
D)



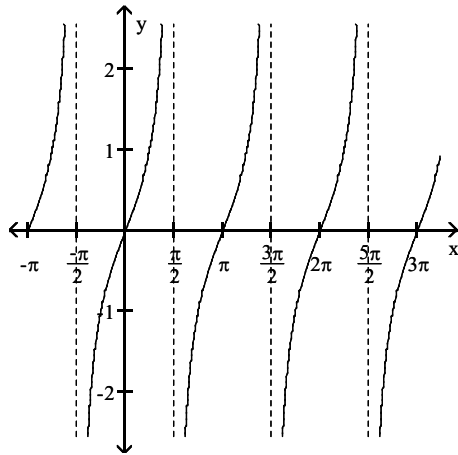
Answer: C

Graph the function.

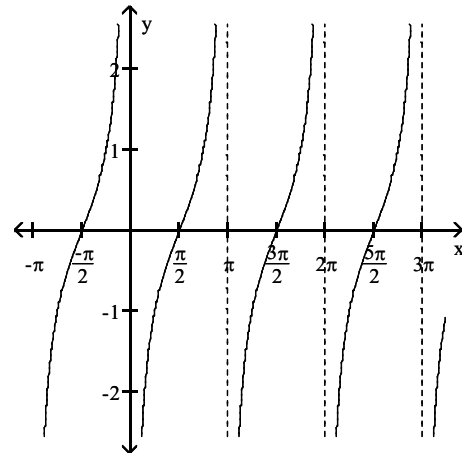
86)  $y = -\tan x$



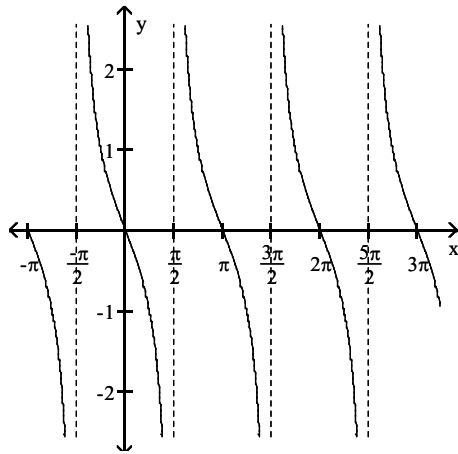
A)



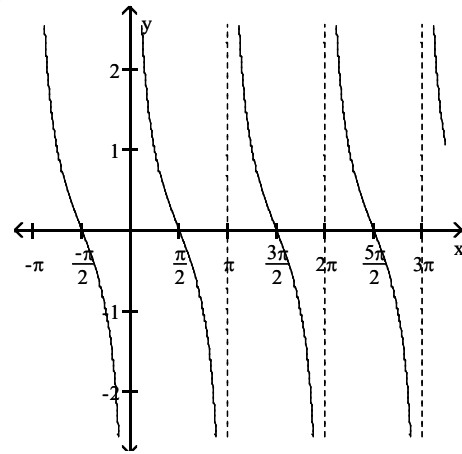
B)



C)

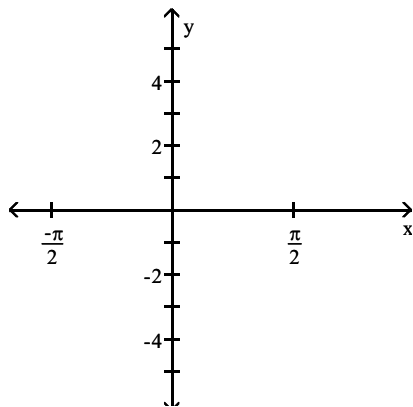


D)

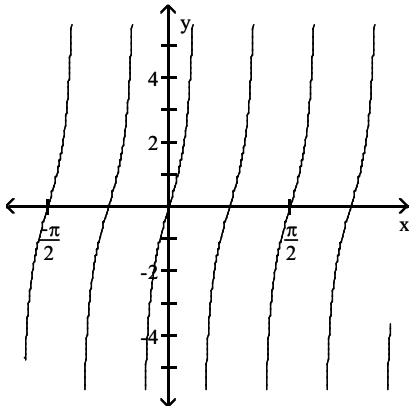


Answer: C

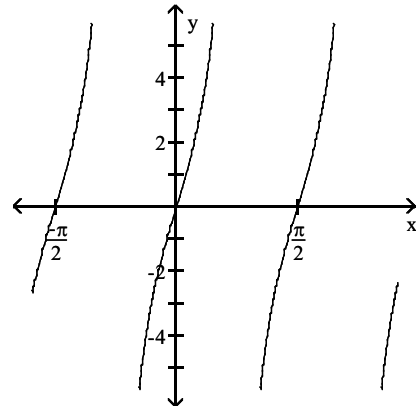
87)  $y = 2 \tan 4x$



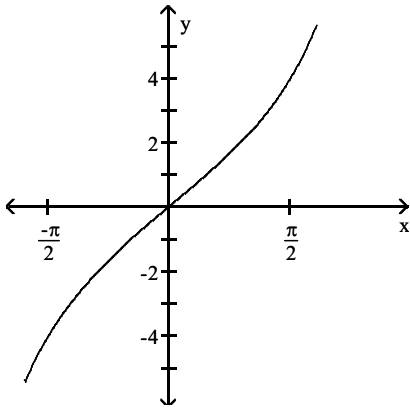
A)



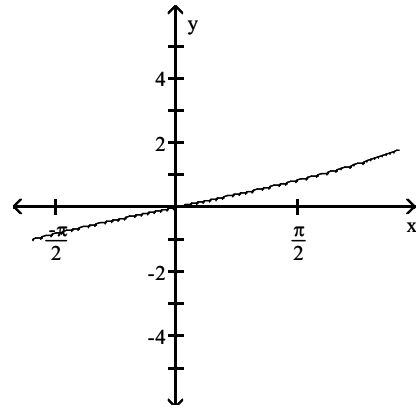
B)



C)

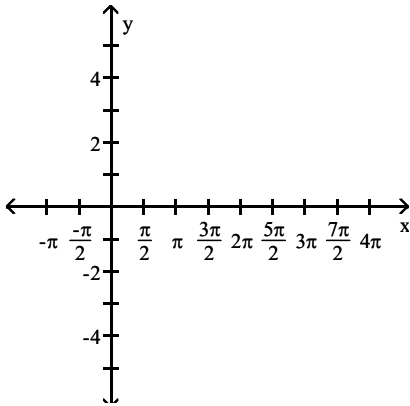


D)

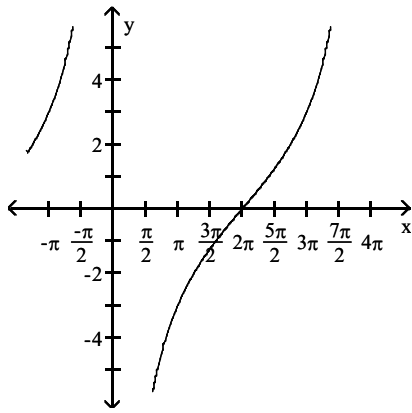


Answer: A

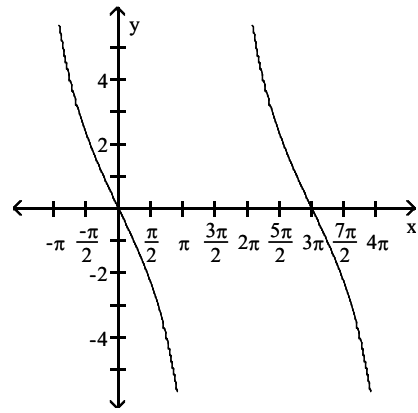
88)  $y = -3 \tan \frac{x}{4}$



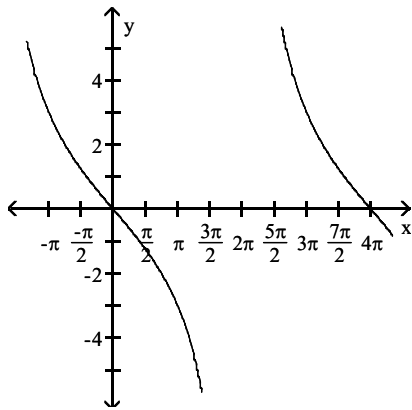
A)



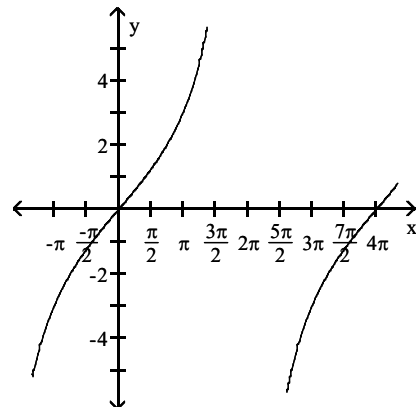
B)



C)

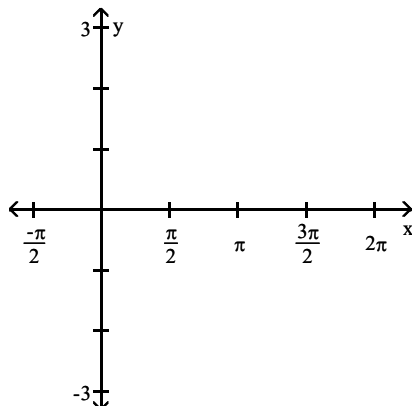


D)

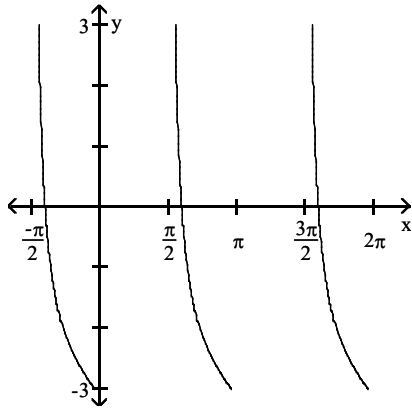


Answer: C

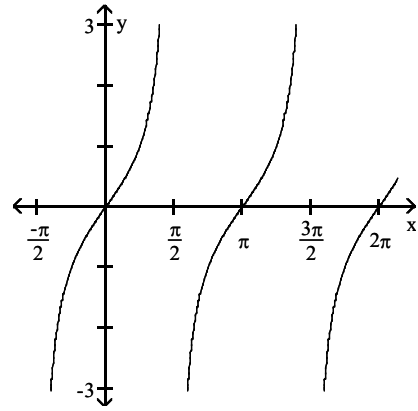
89)  $y = \tan(x - \pi)$



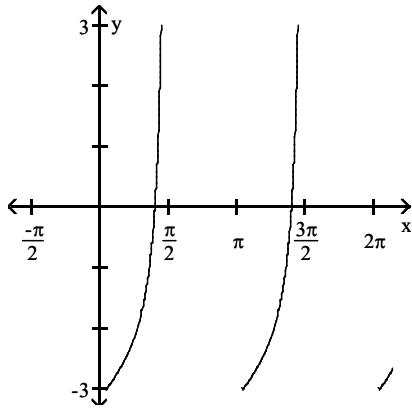
A)



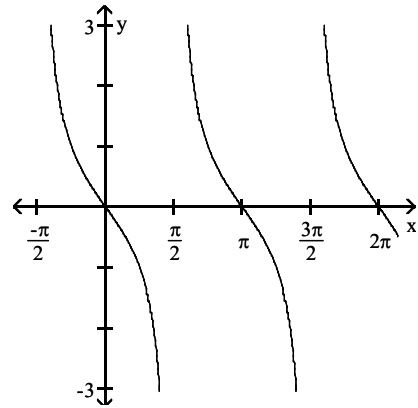
B)



C)

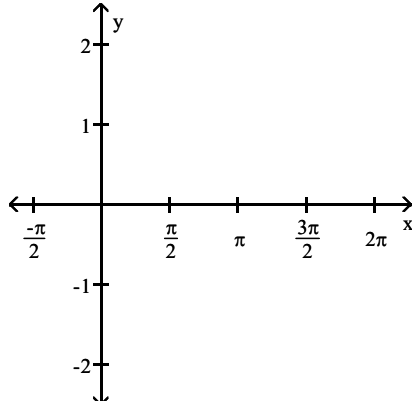


D)

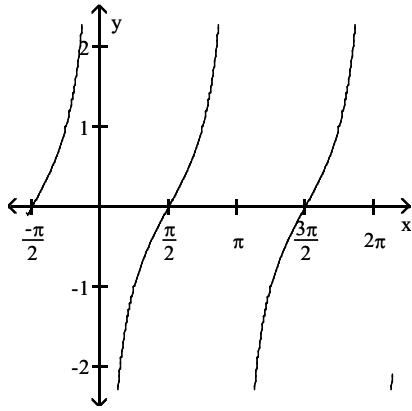


Answer: B

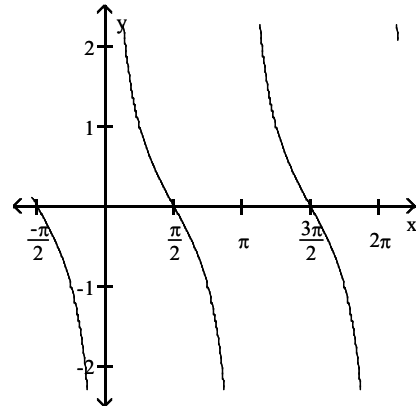
90)  $y = -\tan\left(x + \frac{\pi}{2}\right)$



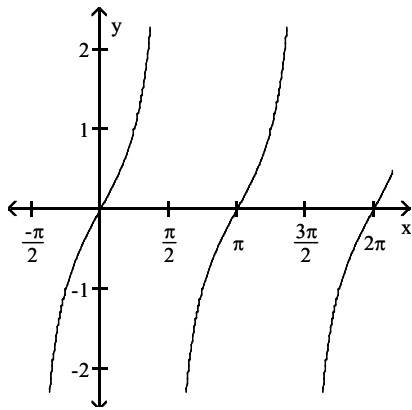
A)



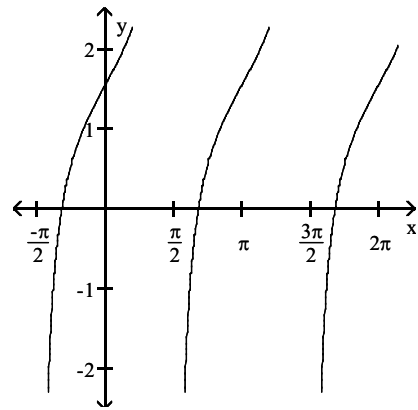
B)



C)



D)

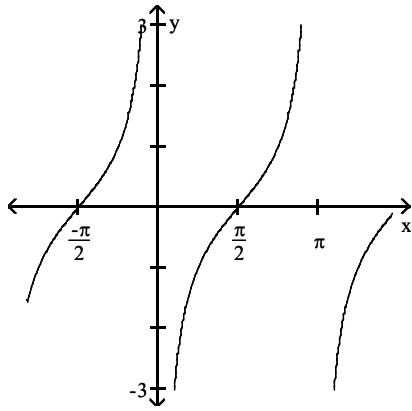


Answer: B

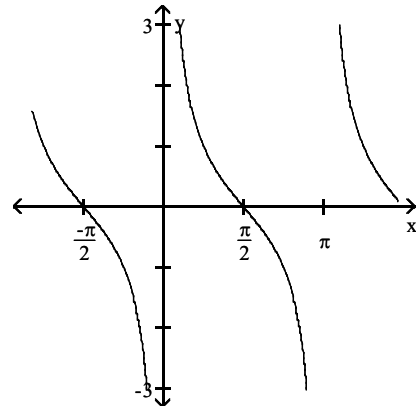
Match the function to its graph.

91)  $y = \cot x$

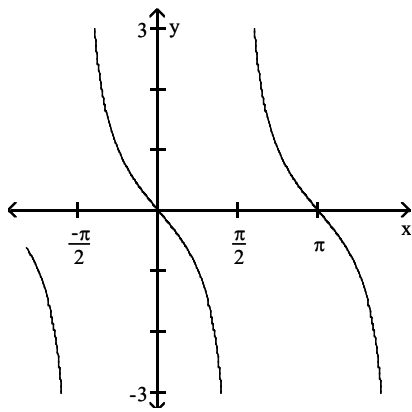
A)



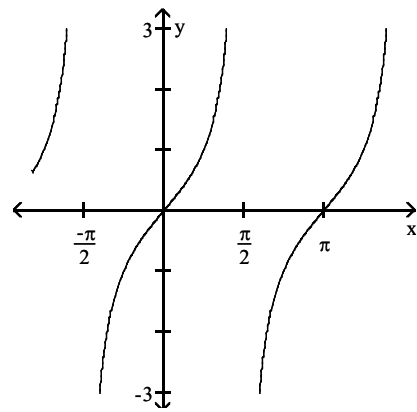
B)



C)



D)

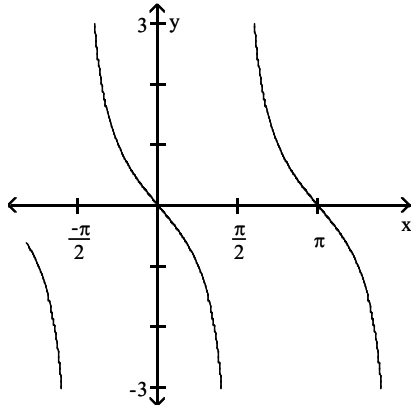


Answer: B

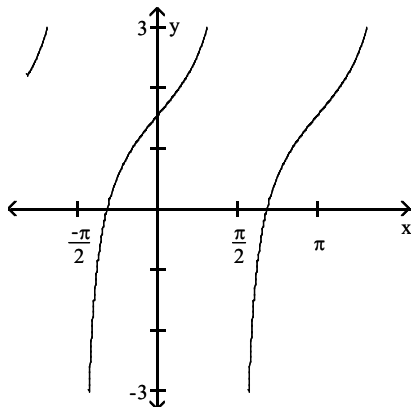


92)  $y = \cot\left(x + \frac{\pi}{2}\right)$

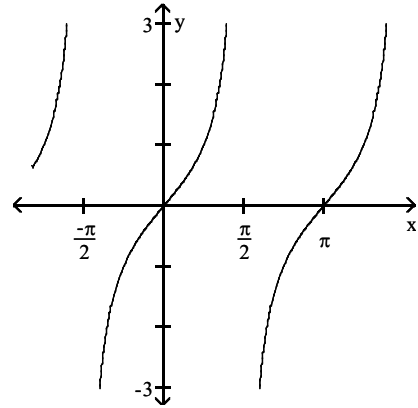
A)



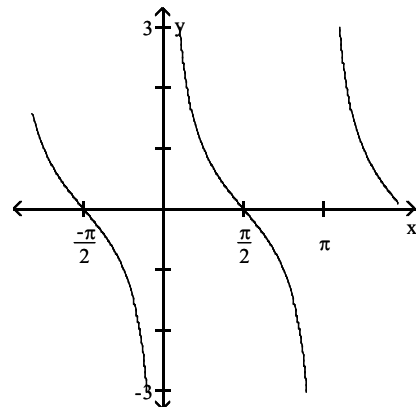
C)



B)



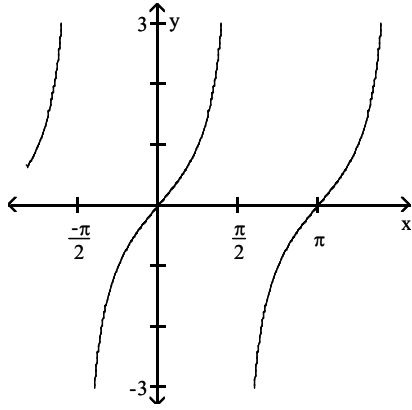
D)



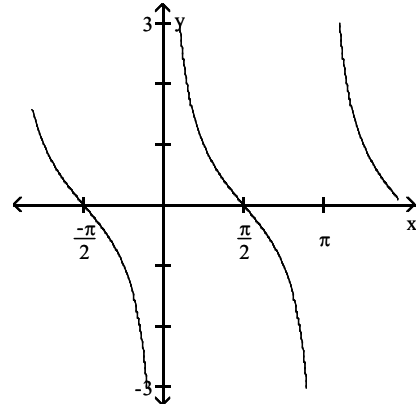
Answer: A

93)  $y = -\cot(x + \pi)$

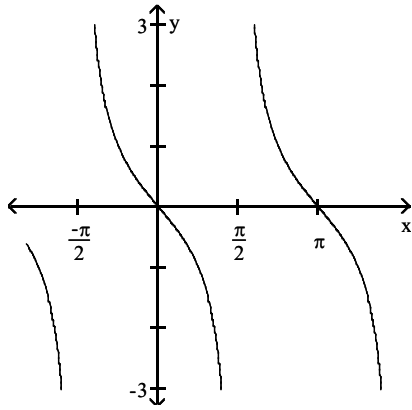
A)



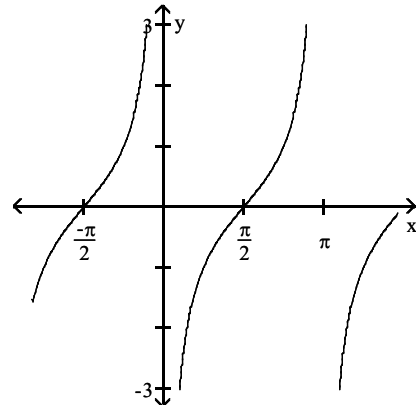
B)



C)



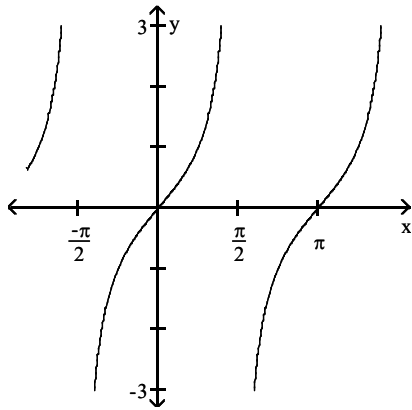
D)



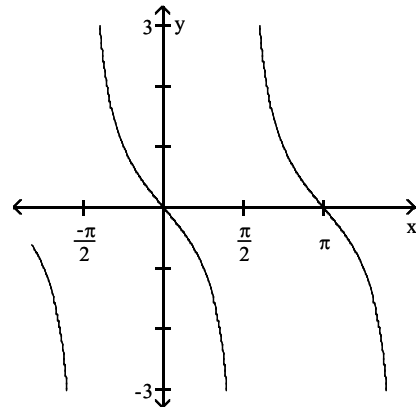
Answer: D

94)  $y = -\cot\left(x - \frac{\pi}{2}\right)$

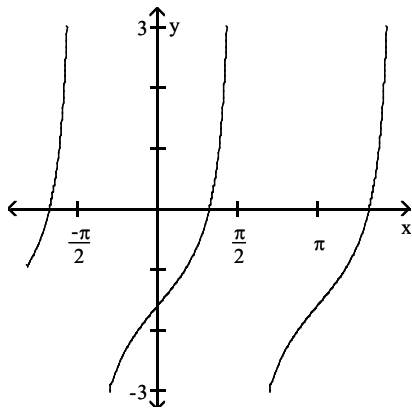
A)



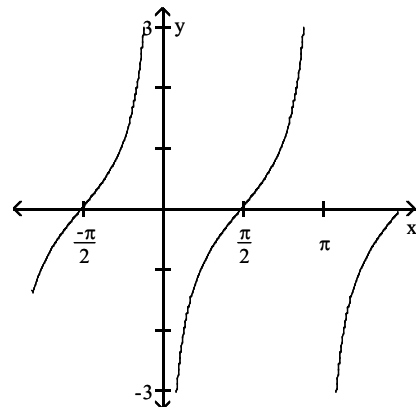
B)



C)



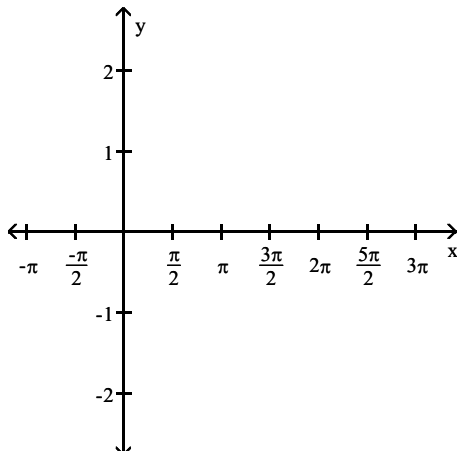
D)



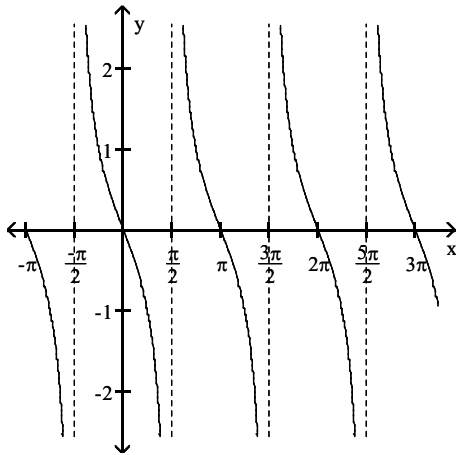
Answer: A

Graph the function.

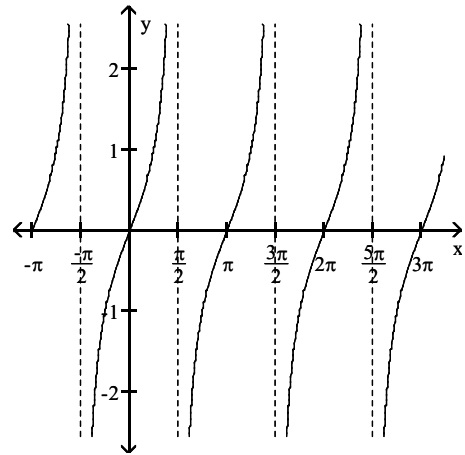
95)  $y = -\cot x$



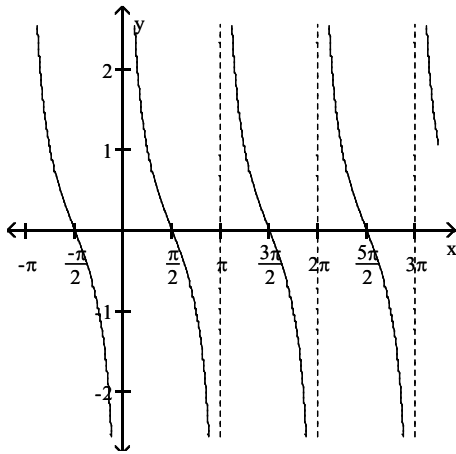
A)



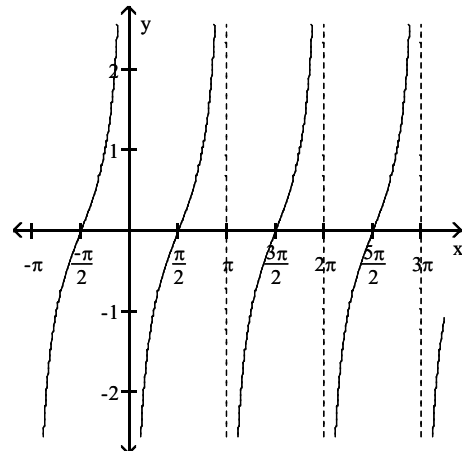
B)



C)

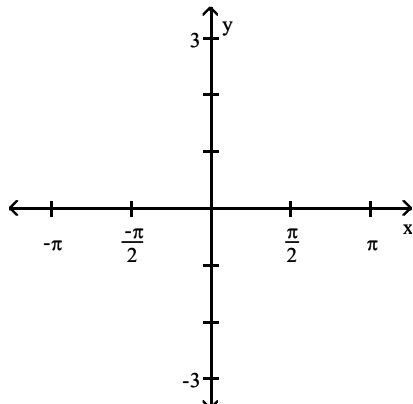


D)

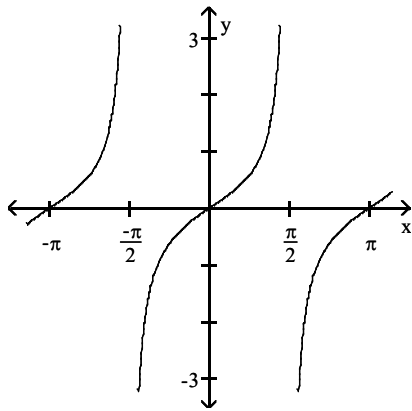


Answer: D

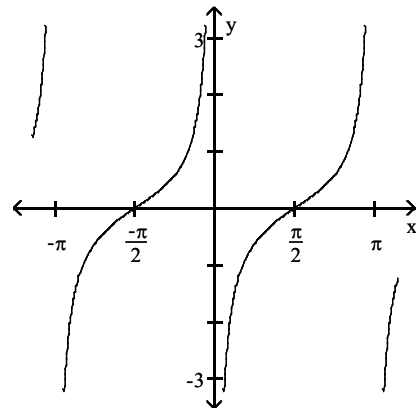
96)  $y = \frac{3}{5} \cot x$



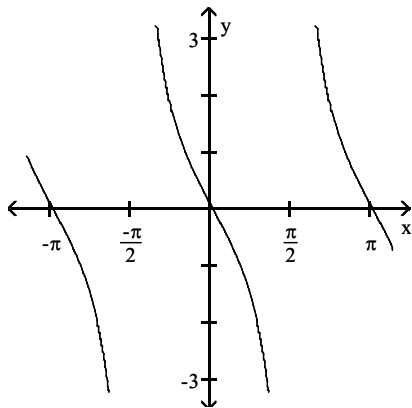
A)



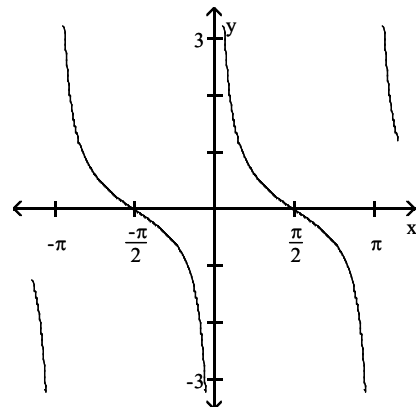
B)



C)

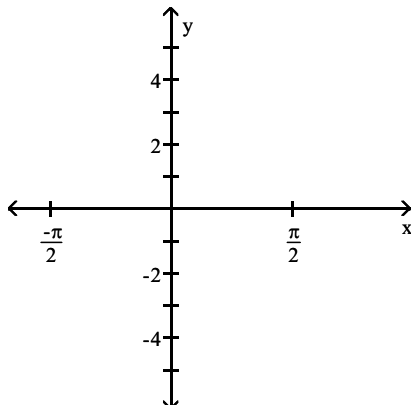


D)

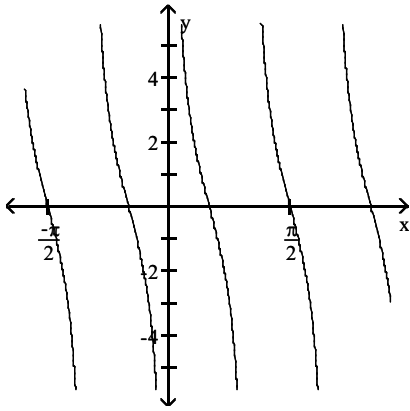


Answer: D

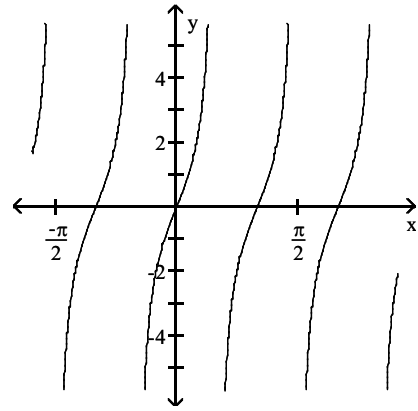
97)  $y = \frac{1}{2} \cot 3x$



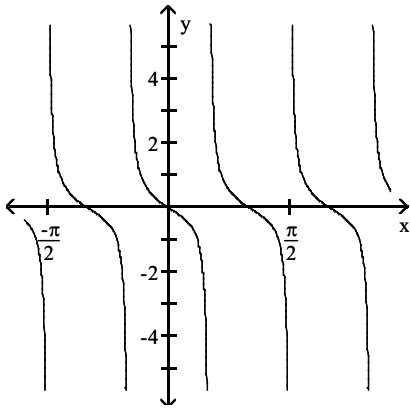
A)



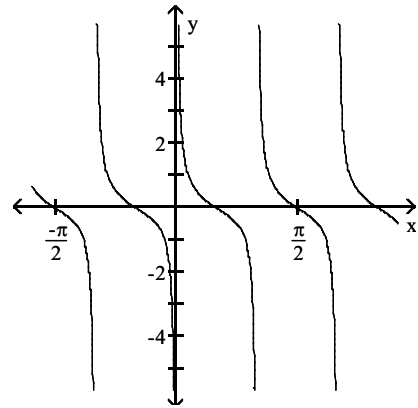
B)



C)

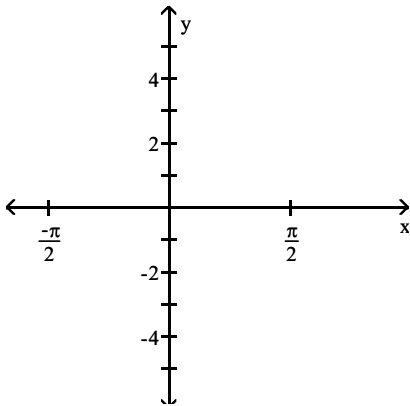


D)

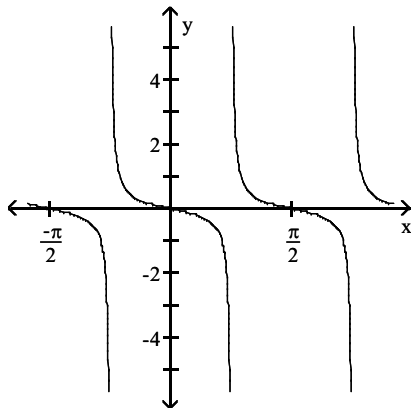


Answer: D

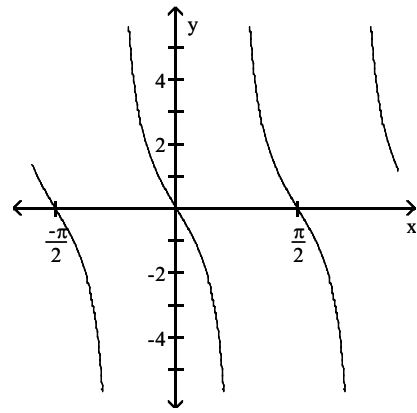
98)  $y = 4 \cot 2x$



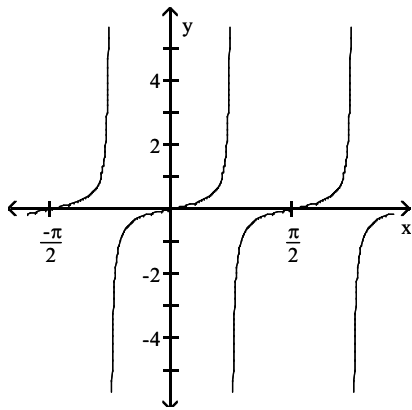
A)



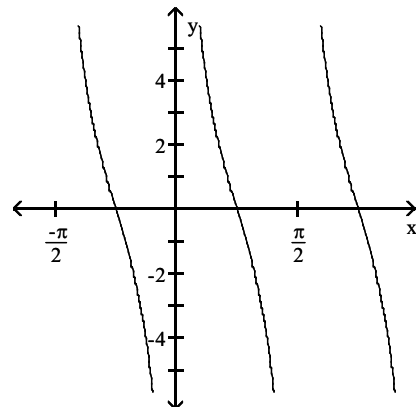
B)



C)

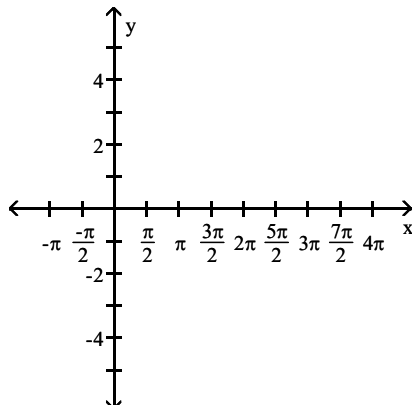


D)

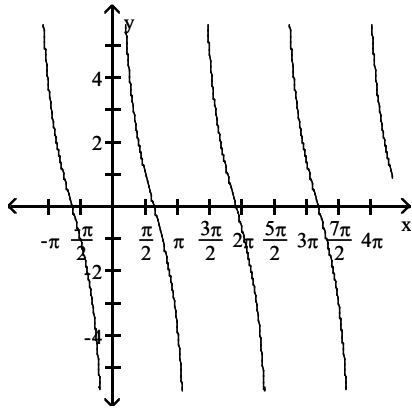


Answer: D

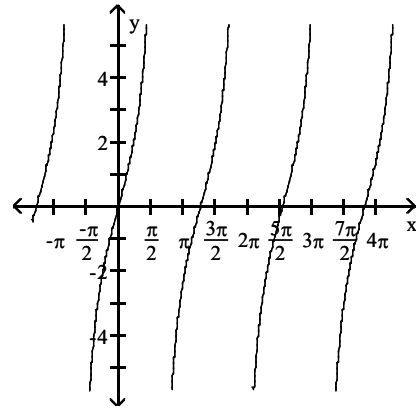
99)  $y = 3 \cot \frac{\pi}{4}x$



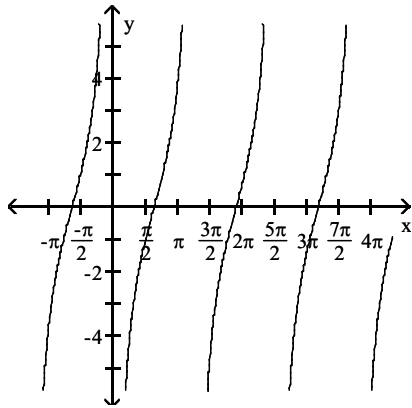
A)



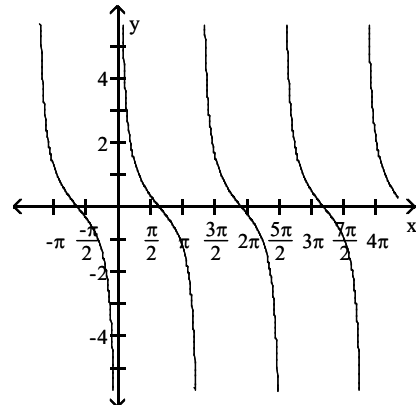
B)



C)

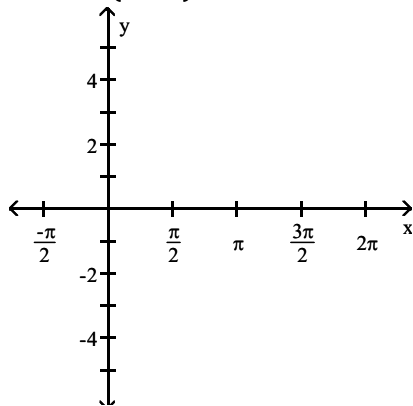


D)



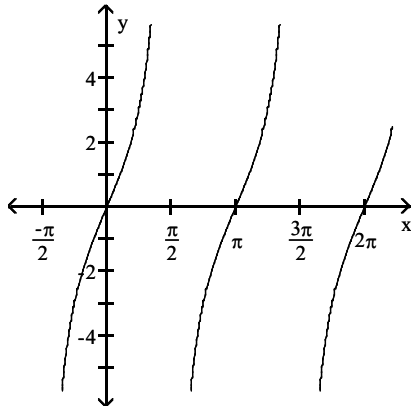
Answer: A

100)  $y = 3 \cot\left(x + \frac{\pi}{2}\right)$

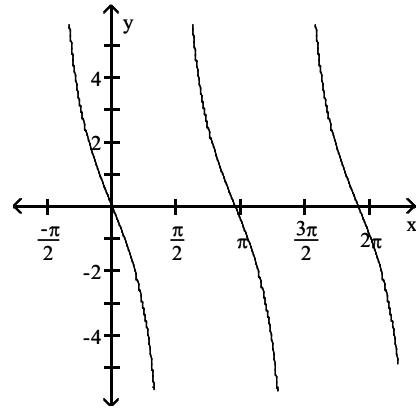




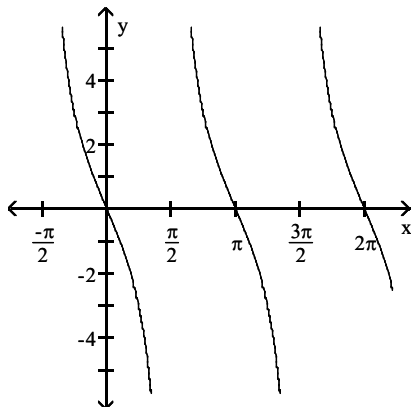
A)



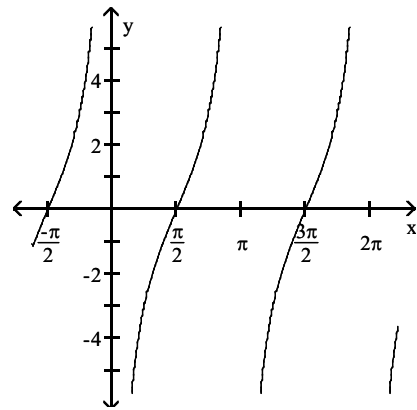
B)



C)



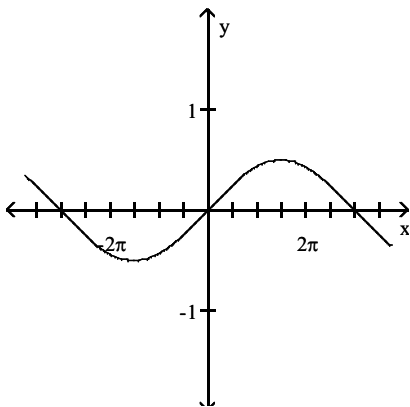
D)



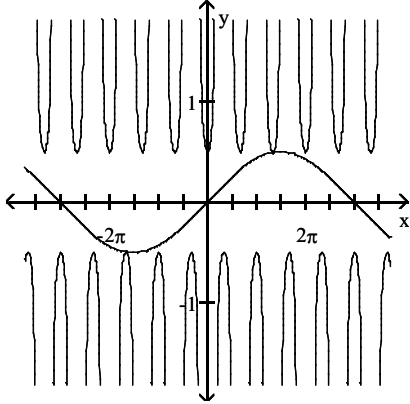
Answer: C

Use the graph to obtain the graph of the reciprocal function. Give the equation of the function for the graph that you obtain.

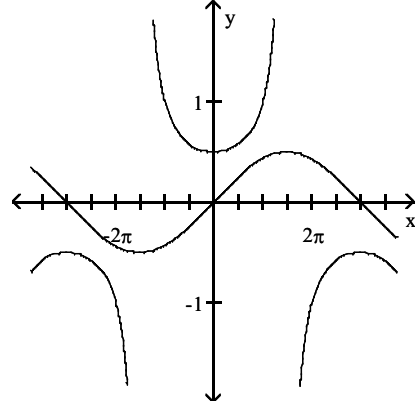
$$101) y = \frac{1}{2} \sin \frac{1}{3}x$$



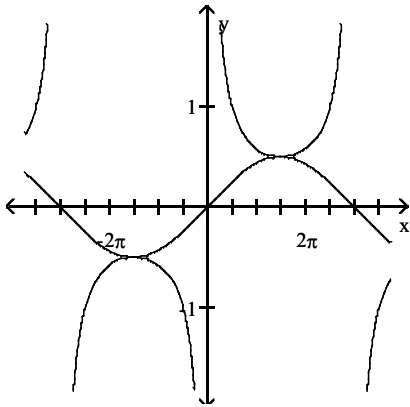
A)  $y = \frac{1}{2} \sec 3x$



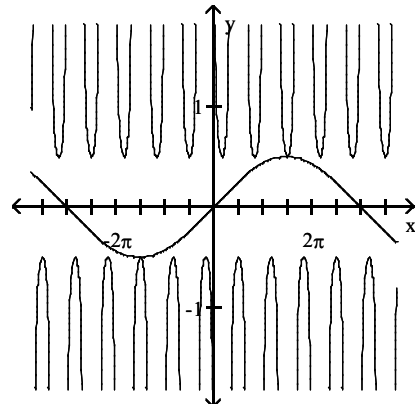
B)  $y = \frac{1}{2} \sec \frac{1}{3}x$



C)  $y = \frac{1}{2} \csc \frac{1}{3}x$

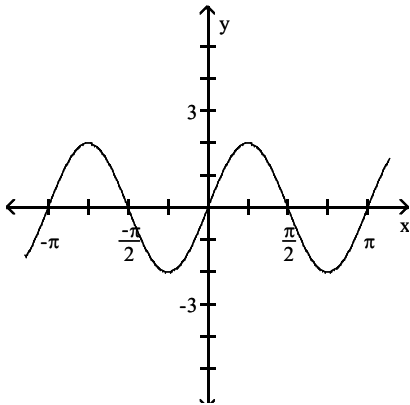


D)  $y = \frac{1}{2} \csc 3x$

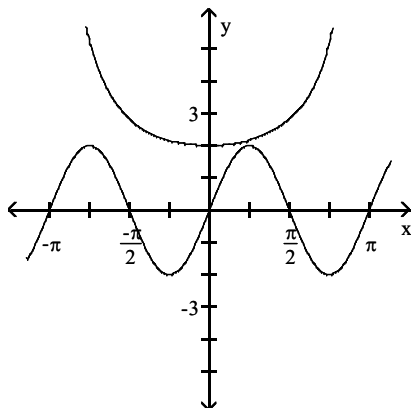


Answer: C

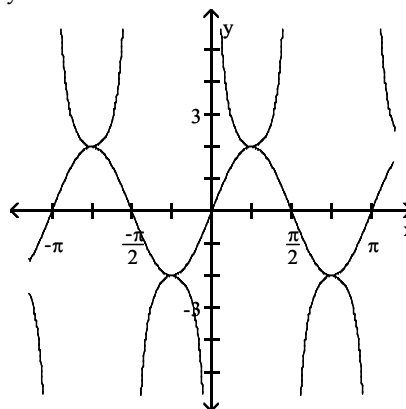
102)  $y = 2 \sin 2x$



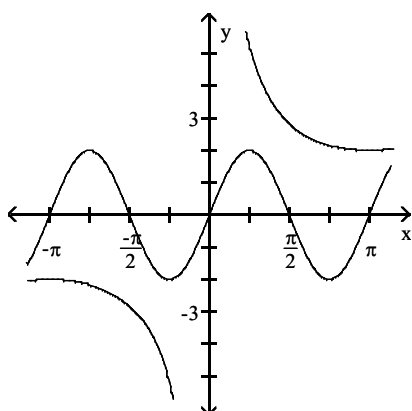
A)  $y = 2 \sec \frac{x}{2}$



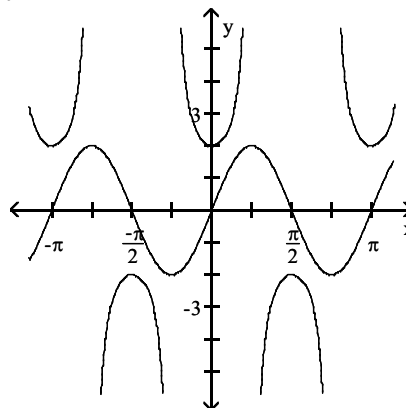
B)  $y = 2 \csc 2x$



C)  $y = 2 \csc \frac{x}{2}$

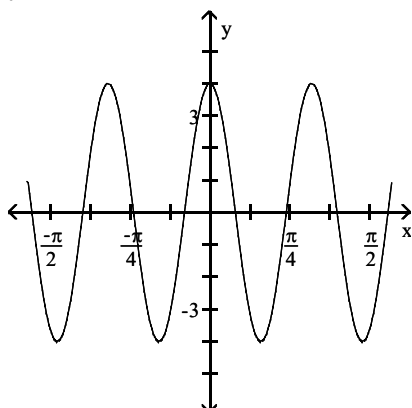


D)  $y = 2 \sec 2x$

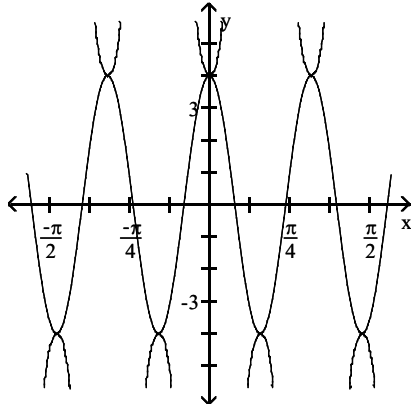


Answer: B

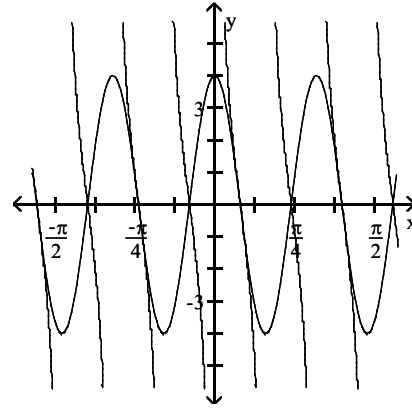
103)  $y = 4 \cos 2\pi x$



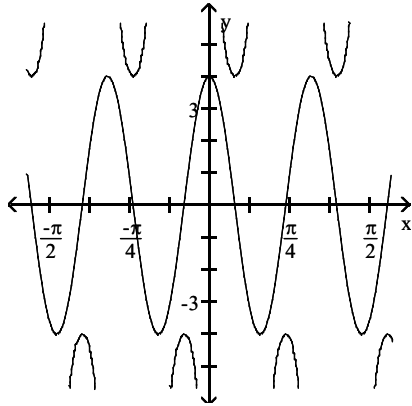
A)  $y = 4 \sec 2\pi x$



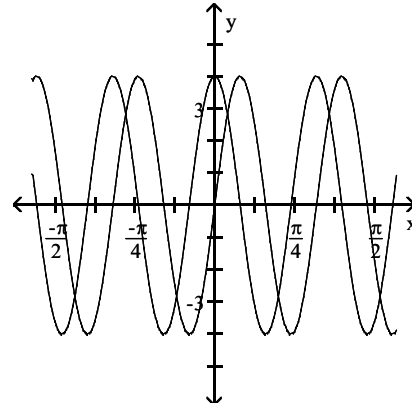
B)  $y = 4 \cot 2\pi x$



C)  $y = 4 \csc 2\pi x$

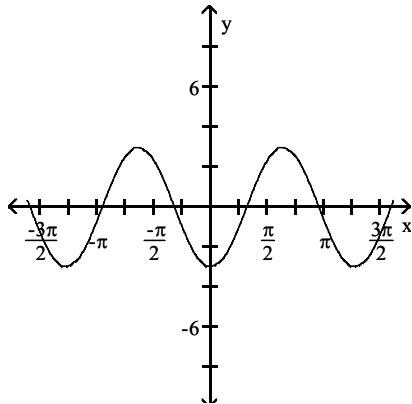


D)  $y = 4 \sin 2\pi x$

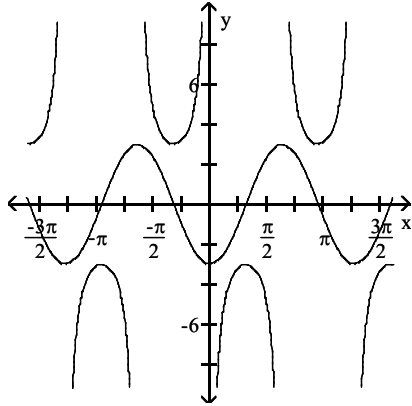


Answer: A

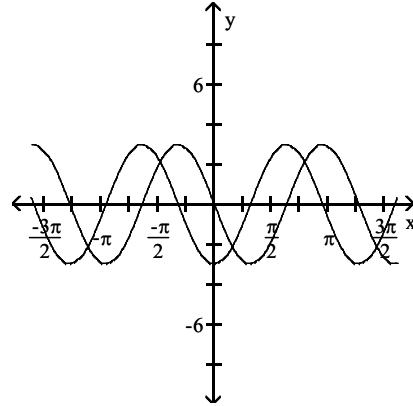
104)  $y = -3 \cos \frac{\pi}{2}x$



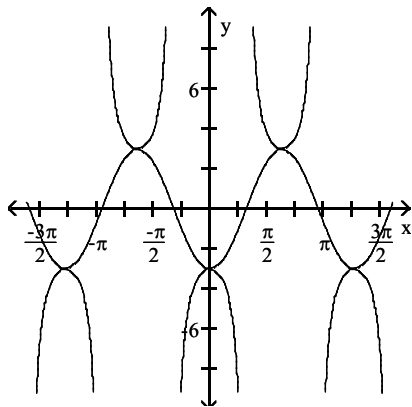
A)  $y = -3 \csc \frac{\pi}{2}x$



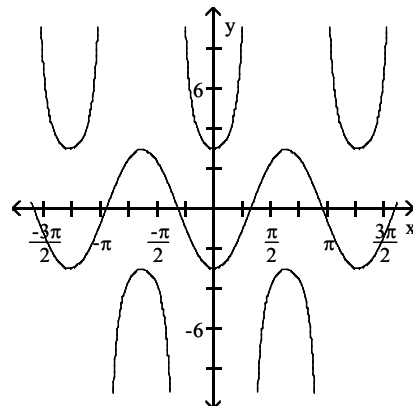
B)  $y = -3 \sin \frac{\pi}{2}x$



C)  $y = -3 \sec \frac{\pi}{2}x$



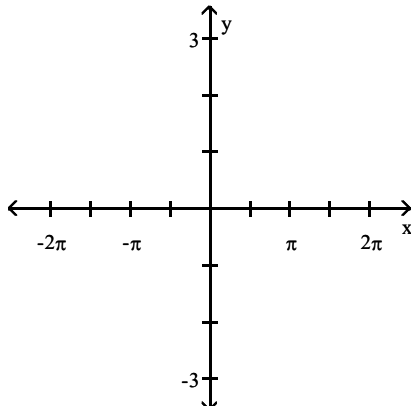
D)  $y = 3 \sec \frac{\pi}{2}x$



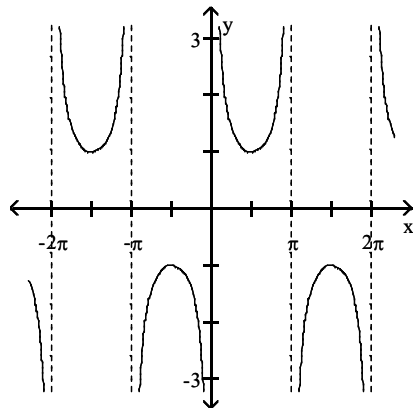
Answer: C

**Graph the function.**

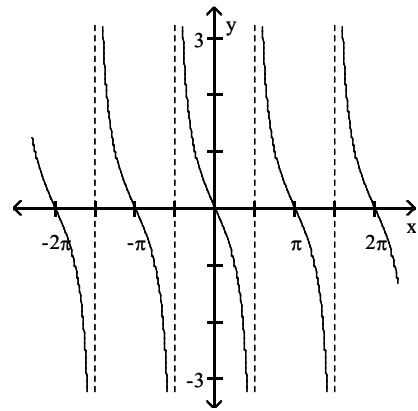
105)  $y = \csc x$



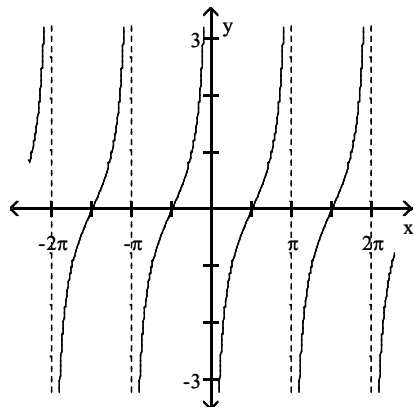
A)



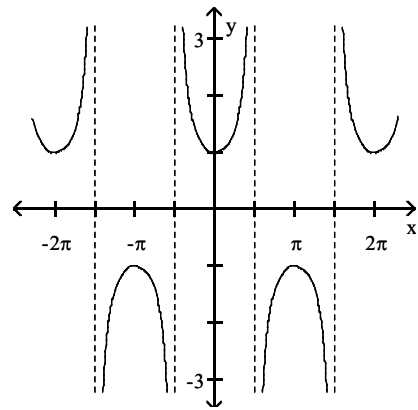
B)



C)

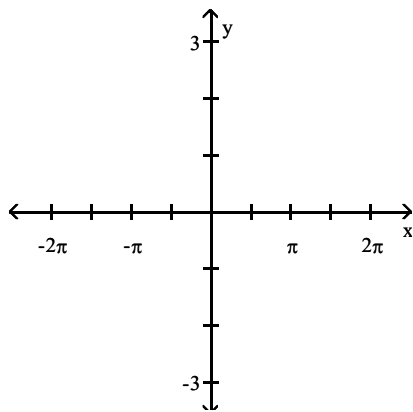


D)

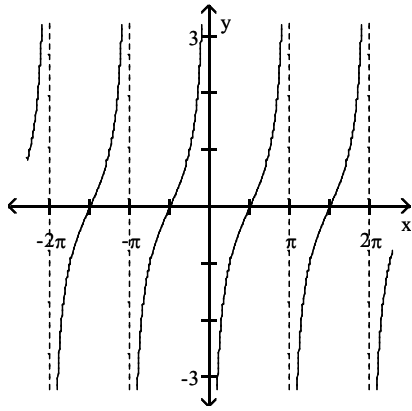


Answer: A

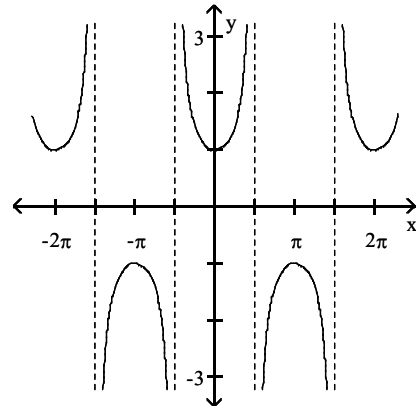
106)  $y = \sec x$



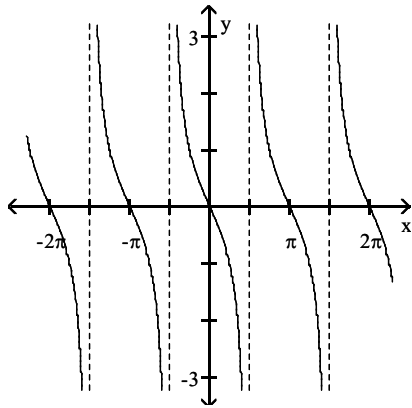
A)



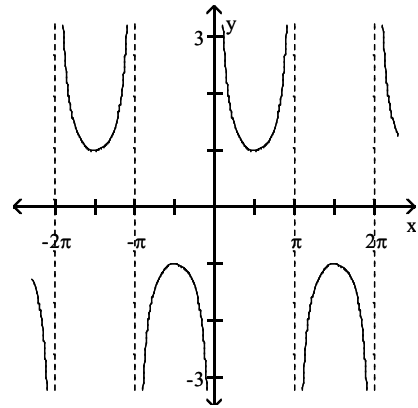
B)



C)

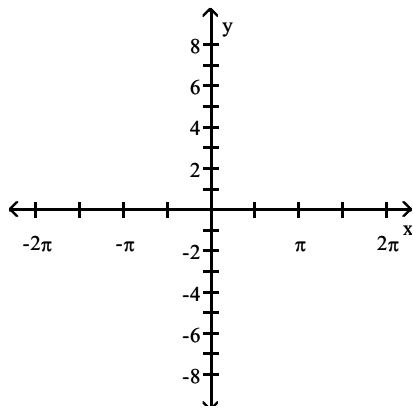


D)

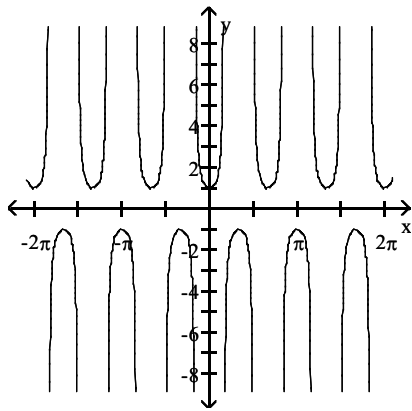


Answer: B

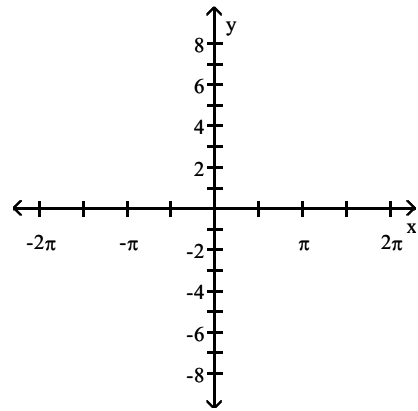
107)  $y = 3 \csc x$



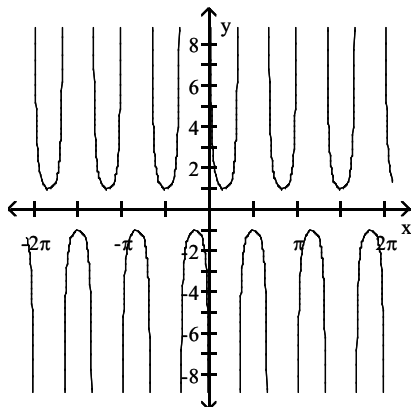
A)



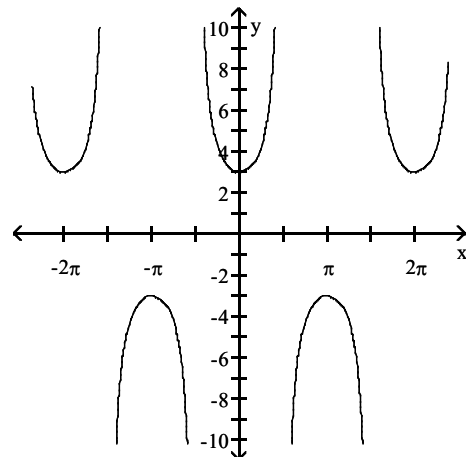
B)



C)

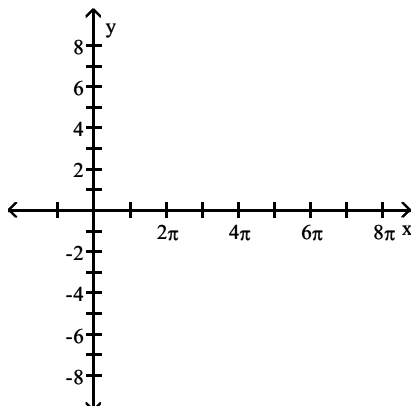


D)



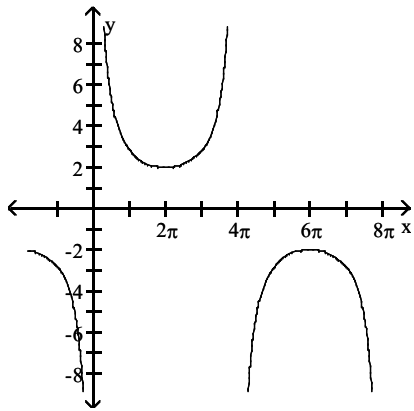
Answer: B

108)  $y = 2 \csc \frac{x}{4}$

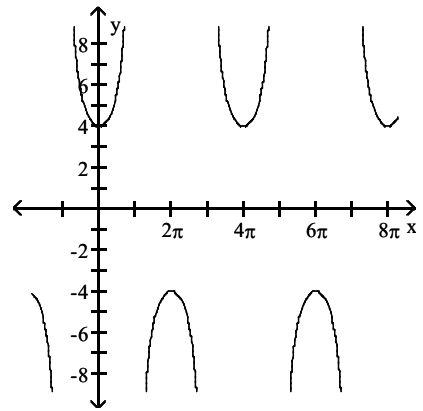




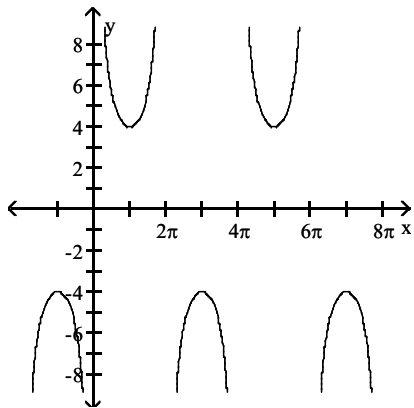
A)



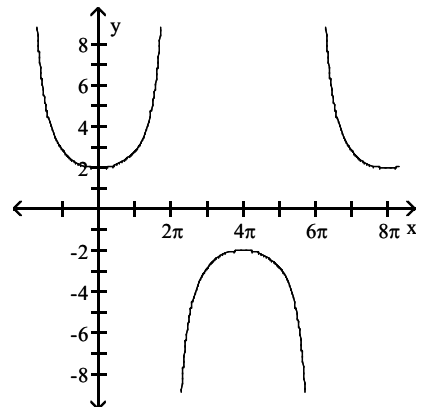
B)



C)

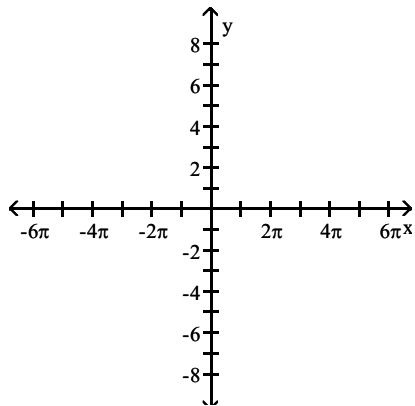


D)

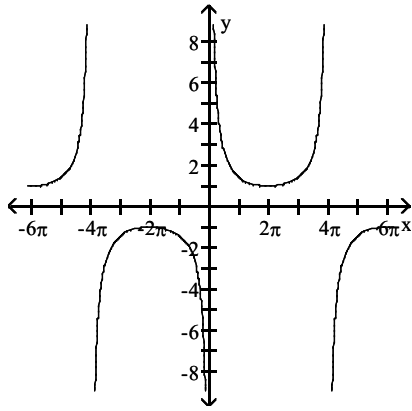


Answer: A

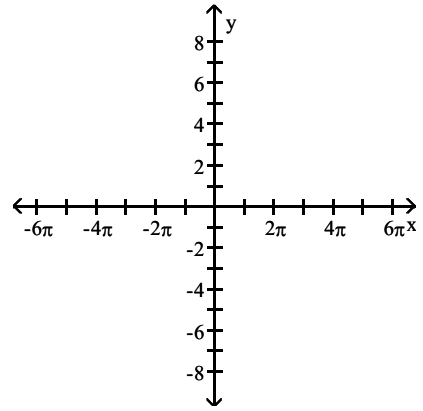
109)  $y = \sec \frac{x}{3}$



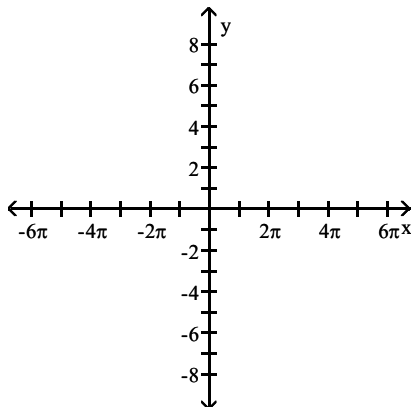
A)



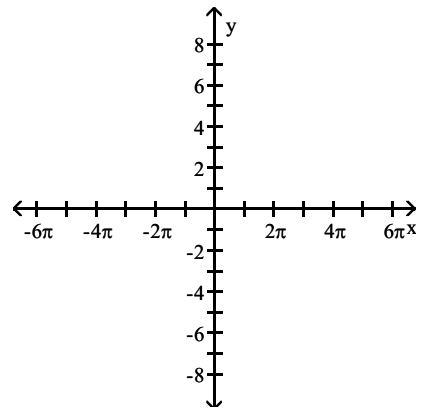
B)



C)

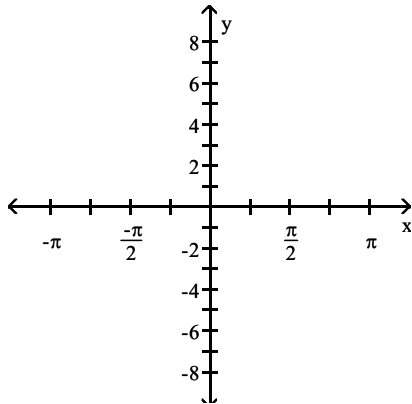


D)

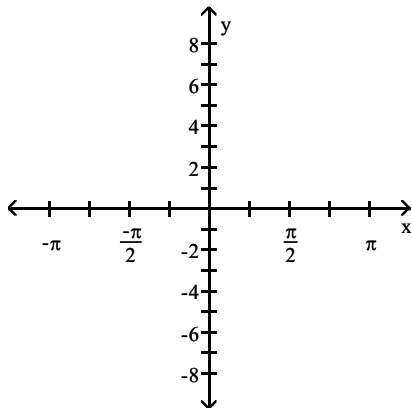


Answer: C

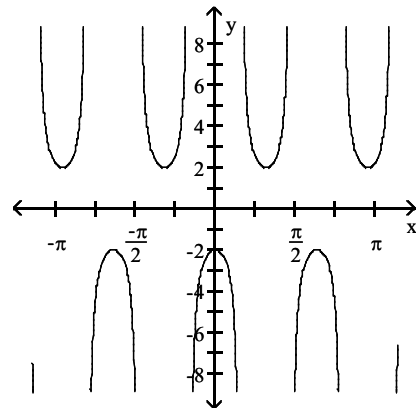
110)  $y = -\frac{1}{2} \csc \pi x$



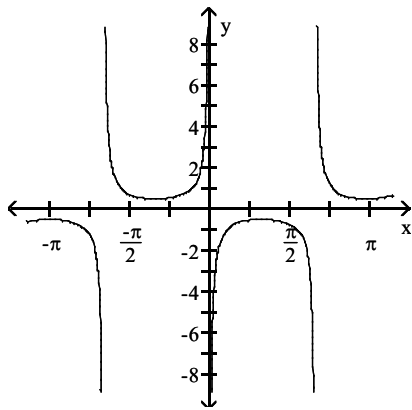
A)



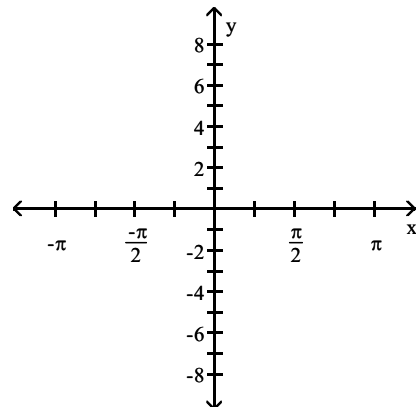
B)



C)

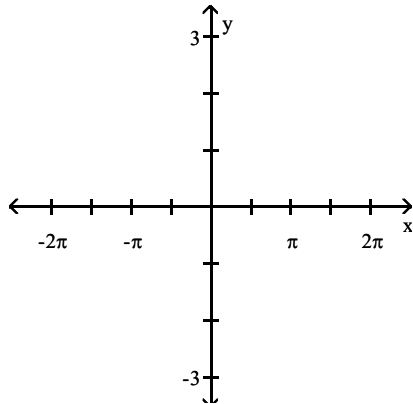


D)

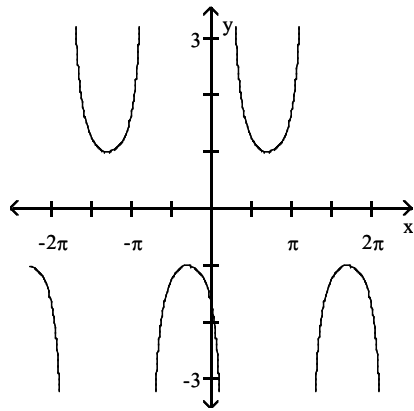


Answer: A

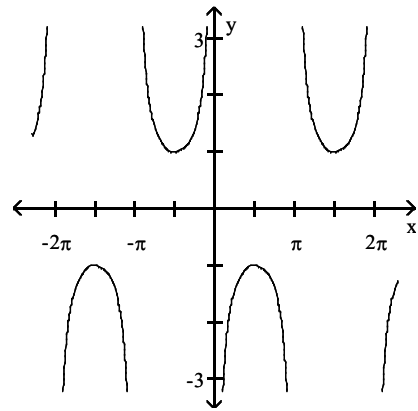
$$111) y = \csc\left(x + \frac{\pi}{5}\right)$$



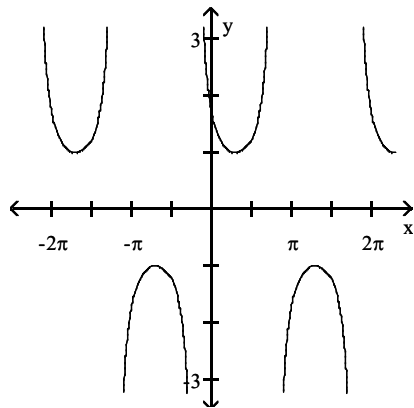
A)



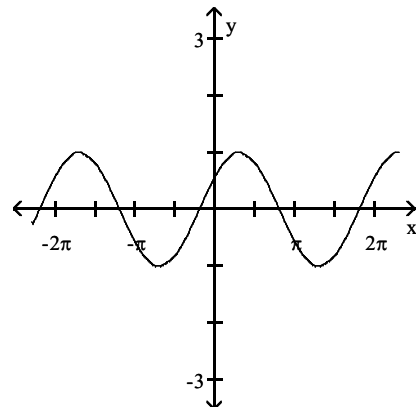
B)



C)

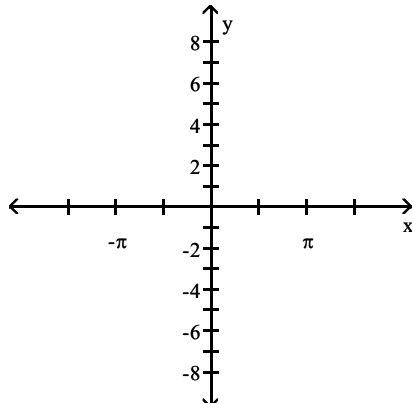


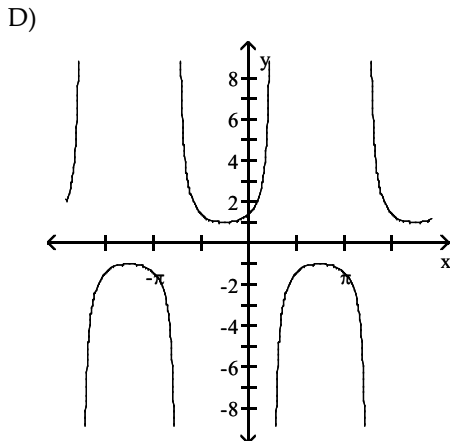
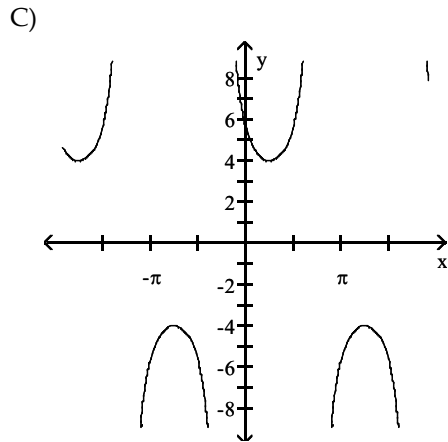
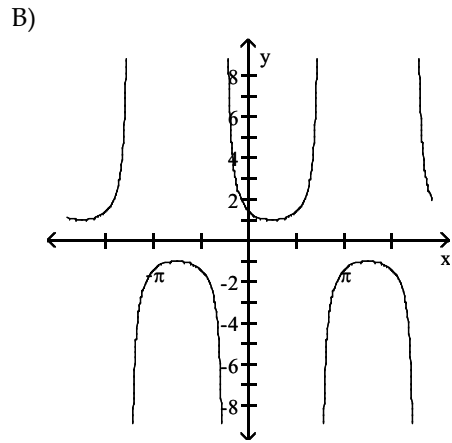
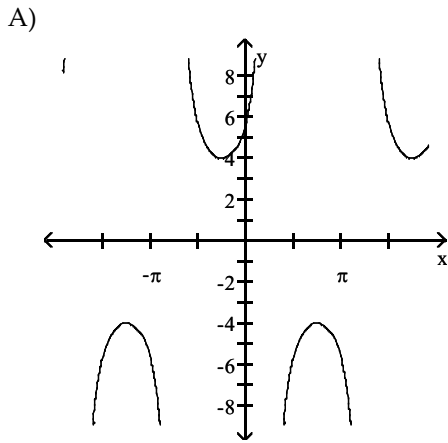
D)



Answer: C

$$112) y = 4 \csc\left(x + \frac{\pi}{4}\right)$$





Answer: C

**Solve the problem.**

113) A rotating beacon is located 10 ft from a wall. If the distance from the beacon to the point on the wall where the beacon is aimed is given by  $a = 10|\sec 2\pi t|$ , where  $t$  is in seconds, find  $a$  when  $t = 0.33$  seconds. Round your answer to the nearest hundredth.

- A) 19.64 feet                      B) -20.76 feet                      C) 20.20 feet                      D) 20.76 feet

Answer: D

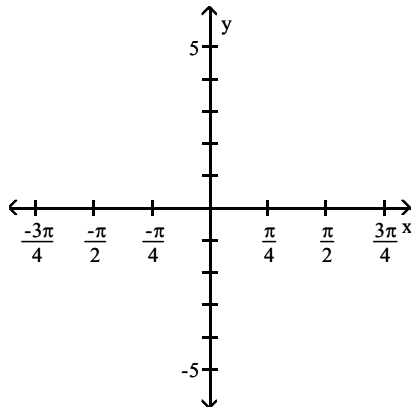
114) The angle of elevation from the top of a house to a plane flying 6300 meters above the house is  $x$  radians. If  $d$  represents the horizontal distance, in meters, of the plane from the house, express  $d$  in terms of a trigonometric function of  $x$ .

- A)  $d = 6300 \sec x$                       B)  $d = 6300 \tan x$                       C)  $d = \frac{6300}{\cot x}$                       D)  $d = 6300 \cot x$

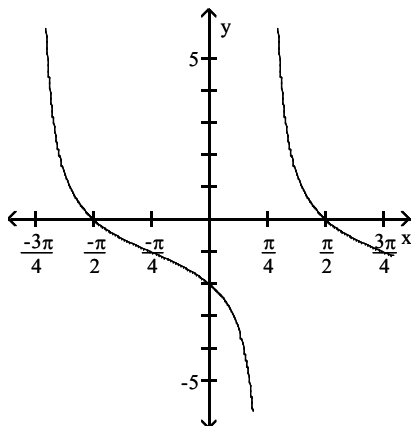
Answer: D

**Graph the function.**

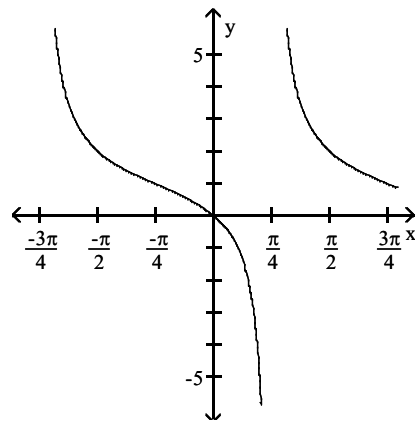
115)  $y = -1 - \tan\left(x + \frac{\pi}{4}\right)$



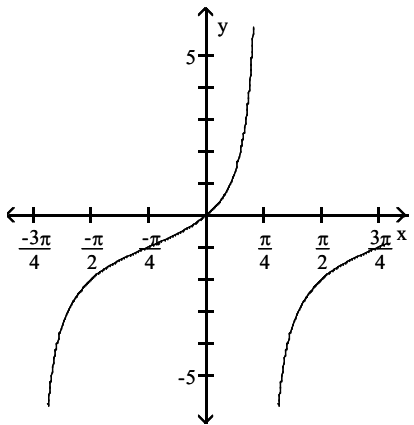
A)



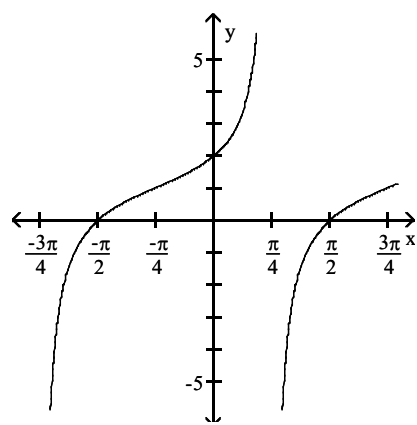
B)



C)

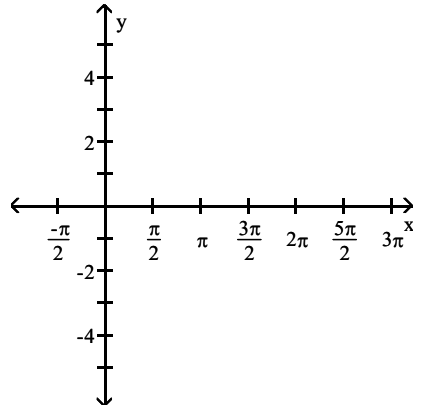


D)

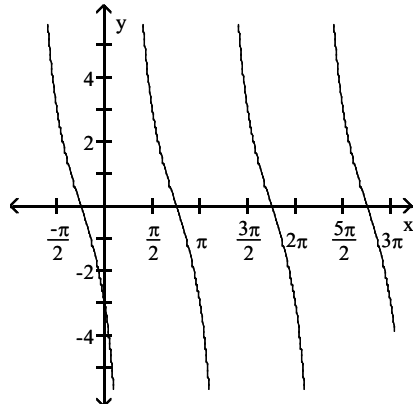


Answer: A

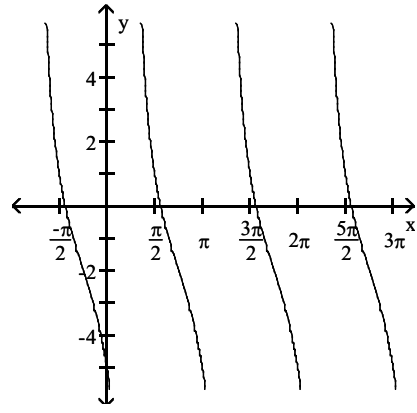
116)  $y = 3 \cot(x - \frac{\pi}{4}) + 2$



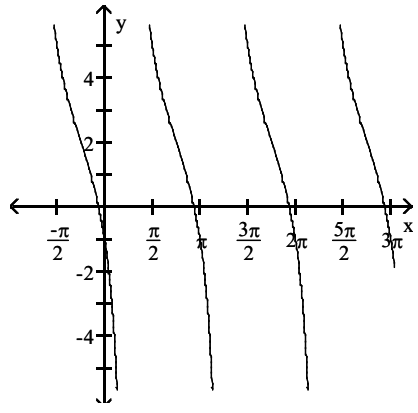
A)



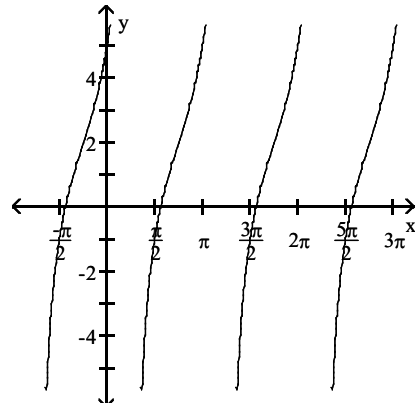
B)



C)

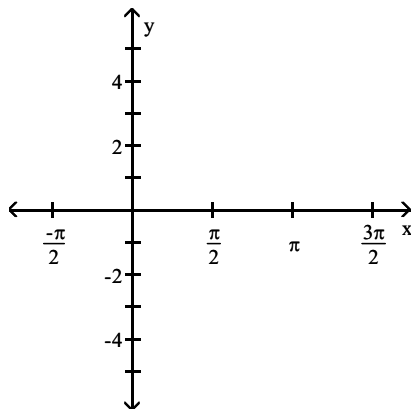


D)

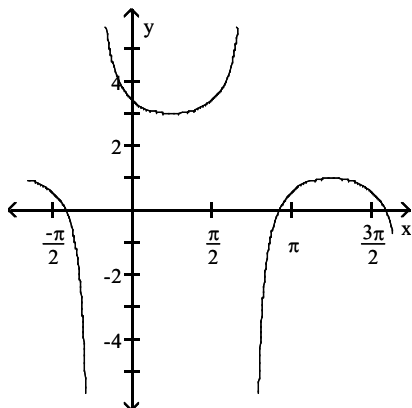


Answer: C

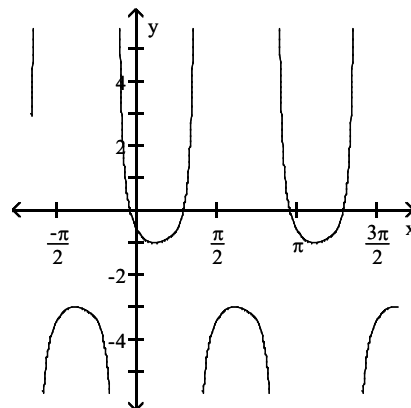
117)  $y = \sec(2x - \frac{\pi}{4}) + 2$



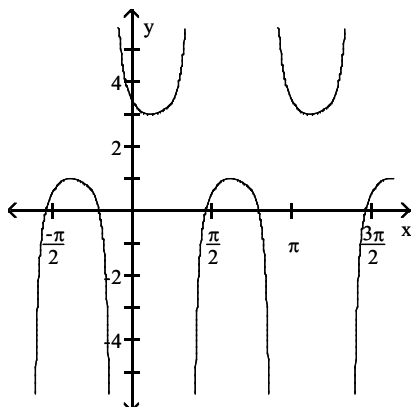
A)



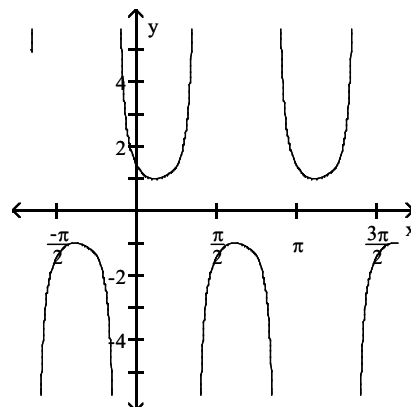
B)



C)



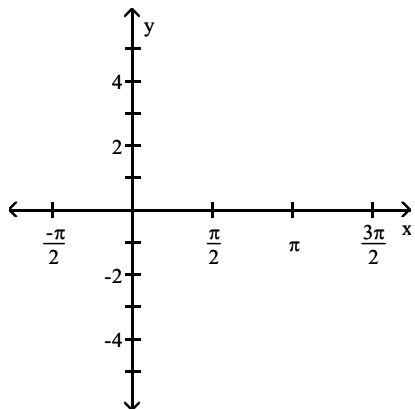
D)



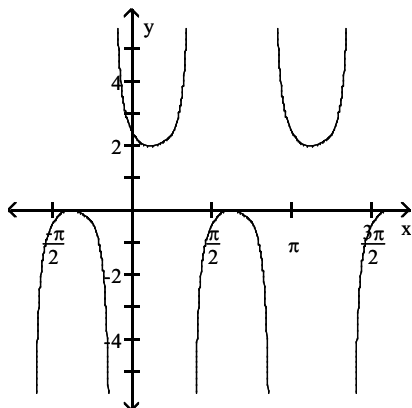
Answer: C



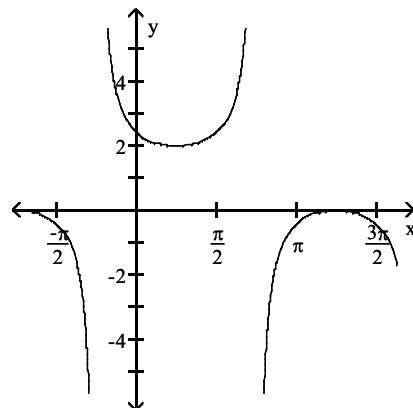
118)  $y = \csc\left(2x + \frac{\pi}{4}\right) + 1$



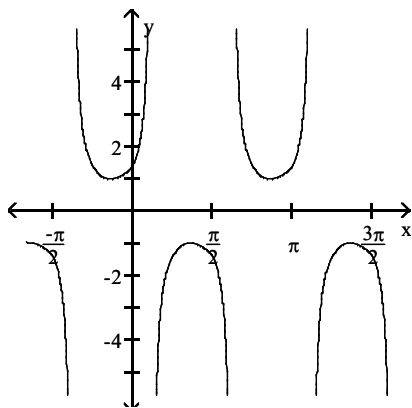
A)



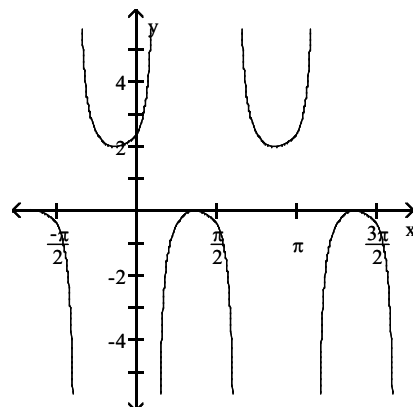
B)



C)

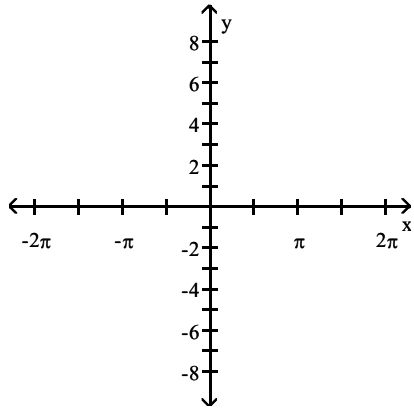


D)

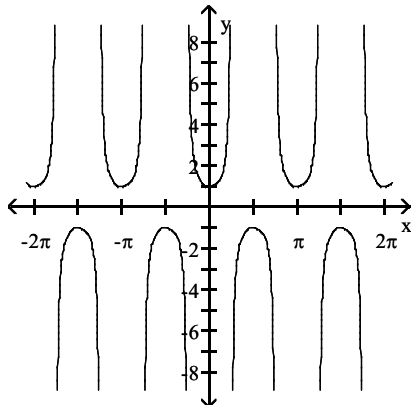


Answer: A

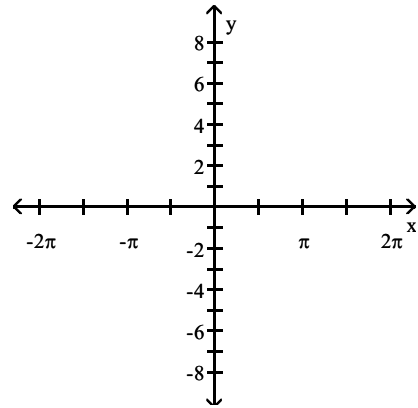
119)  $y = 2 \operatorname{sech} |x|$



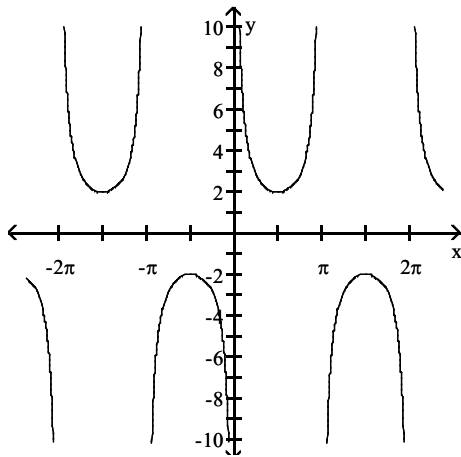
A)



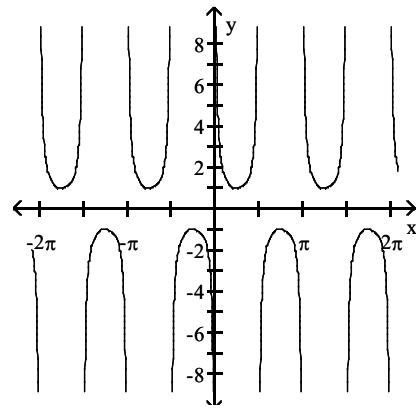
B)



C)

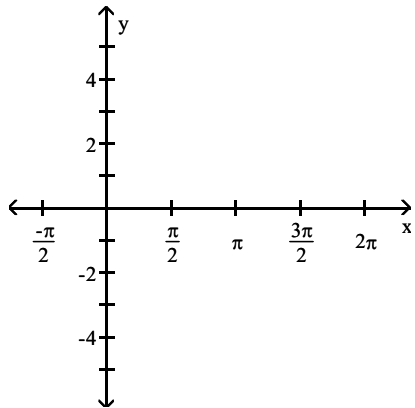


D)

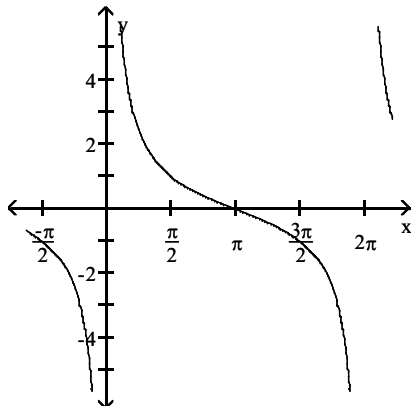


Answer: B

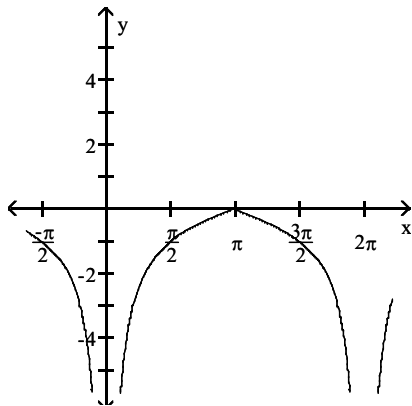
120)  $y = \left| \cot \frac{x}{2} \right|$



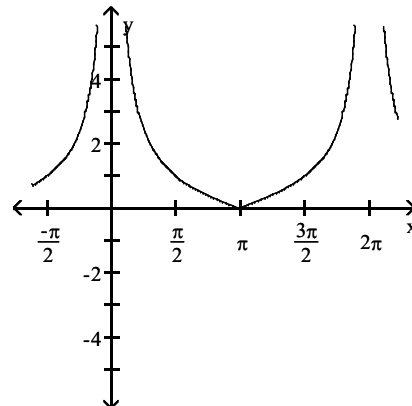
A)



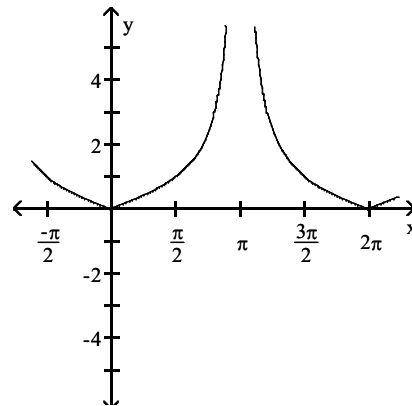
C)



B)



D)



Answer: B

Solve the equation for  $-2\pi \leq x \leq 2\pi$ .

121)  $\sec x = 1$

A)  $-\frac{3\pi}{2}, \frac{\pi}{2}$

B)  $-\pi, \pi$

C)  $-2\pi, 0, 2\pi$

D) none

Answer: C

122)  $\csc x = 1$

A)  $-\pi, \pi$

B)  $-\frac{3\pi}{2}, \frac{\pi}{2}$

C)  $-2\pi, 0, 2\pi$

D) none

Answer: B

**Find the exact value of the expression.**

123)  $\sin^{-1} \frac{\sqrt{3}}{2}$

A)  $\frac{2\pi}{3}$

B)  $\frac{\pi}{4}$

C)  $\frac{3\pi}{4}$

D)  $\frac{\pi}{3}$

Answer: D

124)  $\sin^{-1} (-0.5)$

A)  $\frac{7\pi}{3}$

B)  $\frac{\pi}{6}$

C)  $-\frac{\pi}{6}$

D)  $\frac{\pi}{3}$

Answer: C

125)  $\sin^{-1} (1)$

A)  $\frac{\pi}{4}$

B)  $\pi$

C)  $\frac{\pi}{3}$

D)  $\frac{\pi}{2}$

Answer: D

126)  $\cos^{-1} \frac{\sqrt{2}}{2}$

A)  $\frac{7\pi}{4}$

B)  $\frac{\pi}{4}$

C)  $\frac{\pi}{6}$

D)  $\frac{11\pi}{6}$

Answer: B

127)  $\cos^{-1} \left( -\frac{\sqrt{2}}{2} \right)$

A)  $\frac{3\pi}{4}$

B)  $\frac{-3\pi}{4}$

C)  $\frac{\pi}{4}$

D)  $\frac{-\pi}{4}$

Answer: A

128)  $\cos^{-1} (1)$

A)  $\pi$

B)  $-\pi$

C) 0

D)  $\frac{\pi}{2}$

Answer: C

129)  $\tan^{-1} \sqrt{3}$

A)  $\frac{3\pi}{4}$

B)  $\frac{\pi}{3}$

C)  $\frac{\pi}{6}$

D)  $\frac{5\pi}{4}$

Answer: B

130)  $\tan^{-1}(1)$   
 A)  $\frac{\pi}{4}$                       B)  $\frac{5\pi}{4}$                       C)  $\frac{7\pi}{4}$                       D)  $\frac{3\pi}{4}$

Answer: A

131)  $\tan^{-1}(-\sqrt{3})$   
 A)  $\frac{\pi}{3}$                       B)  $\frac{\pi}{6}$                       C)  $-\frac{\pi}{6}$                       D)  $-\frac{\pi}{3}$

Answer: D

**Use a calculator to find the value of the expression rounded to two decimal places.**

132)  $\tan^{-1}(2.0)$   
 A) 0.46                      B) 63.44                      C) 1.11                      D) 26.57

Answer: C

133)  $\sin^{-1}\left(-\frac{1}{5}\right)$   
 A) -11.54                      B) -0.20                      C) 101.54                      D) 1.77

Answer: B

134)  $\cos^{-1}\left(-\frac{5}{8}\right)$   
 A) -0.68                      B) 2.25                      C) 128.68                      D) -38.68

Answer: B

135)  $\sin^{-1}(-0.4)$   
 A) 1.98                      B) 113.58                      C) -0.41                      D) -23.58

Answer: C

136)  $\sin^{-1}\left(\frac{\sqrt{3}}{3}\right)$   
 A) 0.62                      B) 35.26                      C) 54.74                      D) 0.96

Answer: A

137)  $\cos^{-1}\left(-\frac{\sqrt{7}}{5}\right)$   
 A) 121.95                      B) -31.95                      C) -0.56                      D) 2.13

Answer: D

**Find the exact value of the expression, if possible. Do not use a calculator.**

138)  $\sin^{-1}\left[\sin\left(\frac{5\pi}{7}\right)\right]$   
 A)  $\frac{7}{5\pi}$                       B)  $\frac{5\pi}{7}$                       C)  $\frac{7}{2\pi}$                       D)  $\frac{2\pi}{7}$

Answer: D

$$139) \tan^{-1} \left[ \tan \left( \frac{6\pi}{7} \right) \right]$$

A)  $\frac{\pi}{7}$

B)  $\frac{6\pi}{7}$

C)  $-\frac{6\pi}{7}$

D)  $-\frac{\pi}{7}$

Answer: D

$$140) \cos^{-1}(\cos \pi)$$

A)  $\frac{\pi}{2}$

B)  $\frac{\pi}{3}$

C) 0

D)  $\pi$

Answer: D

$$141) \cos^{-1} \left[ \cos \left( -\frac{\pi}{6} \right) \right]$$

A)  $\frac{7\pi}{6}$

B)  $-\frac{\pi}{6}$

C)  $\frac{\pi}{6}$

D)  $\frac{5\pi}{6}$

Answer: C

$$142) \tan^{-1} \left( \tan \frac{6\pi}{7} \right)$$

A)  $\frac{6\pi}{7}$

B)  $-\frac{\pi}{7}$

C)  $-\frac{8\pi}{7}$

D)  $\frac{8\pi}{7}$

Answer: B

$$143) \cos(\cos^{-1} 0.4)$$

A) 2.7

B) 0.9

C) 0.4

D) 3.5

Answer: C

$$144) \tan(\tan^{-1}(-7.5))$$

A) -4.4

B) 10.6

C) 7.5

D) -7.5

Answer: D

**Use a sketch to find the exact value of the expression.**

$$145) \cos \left( \sin^{-1} \frac{3}{5} \right)$$

A)  $-\frac{4}{5}$

B)  $\frac{1}{5}$

C)  $\frac{4}{5}$

D)  $-\frac{3}{5}$

Answer: C

$$146) \cos \left( \tan^{-1} \frac{6}{7} \right)$$

A)  $\frac{6}{7}$

B)  $\frac{7}{85}$

C)  $\frac{7\sqrt{85}}{85}$

D)  $\frac{\sqrt{85}}{7}$

Answer: C

$$147) \cot \left( \sin^{-1} \frac{8\sqrt{145}}{145} \right)$$

A)  $\frac{8}{145}$

B)  $-\frac{9}{8}$

C)  $\frac{9}{8}$

D)  $\frac{\sqrt{145}}{8}$

Answer: C

$$148) \csc \left( \tan^{-1} \frac{\sqrt{3}}{3} \right)$$

A)  $\sqrt{3}$

B) 2

C)  $\frac{2\sqrt{3}}{3}$

D)  $\frac{1}{2}$

Answer: B

$$149) \cot \left( \sin^{-1} \frac{\sqrt{2}}{2} \right)$$

A)  $\sqrt{2}$

B) 1

C)  $\frac{\sqrt{2}}{2}$

D) 2

Answer: B

**Use a right triangle to write the expression as an algebraic expression. Assume that x is positive and in the domain of the given inverse trigonometric function.**

$$150) \sin(\tan^{-1} x)$$

A)  $x\sqrt{x^2 + 1}$

B)  $\frac{x\sqrt{x^2 + 1}}{x^2 + 1}$

C)  $\frac{x\sqrt{x^2 - 1}}{x^2 - 1}$

D)  $\frac{\sqrt{x^2 + 1}}{x^2 + 1}$

Answer: B

$$151) \cos(\tan^{-1} x)$$

A)  $x\sqrt{x^2 + 1}$

B)  $\frac{x\sqrt{x^2 + 1}}{x^2 + 1}$

C)  $\frac{\sqrt{x^2 + 1}}{x^2 + 1}$

D)  $\frac{\sqrt{x^2 - 1}}{x^2 - 1}$

Answer: C

$$152) \cos(\sin^{-1} x)$$

A)  $\frac{\sqrt{x^2 + 1}}{x}$

B)  $\sqrt{1 - x^2}$

C)  $\sqrt{x^2 + 1}$

D)  $\sqrt{x^2 - 1}$

Answer: B

$$153) \sin(\tan^{-1} \frac{x}{\sqrt{2}})$$

A)  $\frac{\sqrt{x^2 + 2}}{x^2 + 2}$

B)  $\frac{x\sqrt{x^2 - 2}}{x^2 - 2}$

C)  $\frac{x\sqrt{x^2 + 2}}{x^2 + 2}$

D)  $x\sqrt{x^2 + 2}$

Answer: C

154)  $\sin(\sin^{-1} \frac{x}{\sqrt{3}})$

A)  $x\sqrt{3}$

B)  $\frac{\sqrt{x^2+3}}{x^2+3}$

C)  $\frac{x\sqrt{x^2-3}}{x^2-3}$

D)  $\frac{x\sqrt{3}}{3}$

Answer: D

155)  $\tan(\sec^{-1} \frac{\sqrt{x^2+9}}{x})$

A)  $\frac{\sqrt{x^2+3}}{x^2+3}$

B)  $\frac{3}{x}$

C)  $\frac{x\sqrt{x^2+9}}{x^2+9}$

D)  $3x$

Answer: B

156)  $\sin(\sec^{-1} \frac{\sqrt{x^2+4}}{x})$

A)  $\frac{x\sqrt{x^2+2}}{x^2+2}$

B)  $x\sqrt{2}$

C)  $\frac{\sqrt{x^2+2}}{x^2+2}$

D)  $\frac{2\sqrt{x^2+4}}{x^2+4}$

Answer: D

**Solve the problem.**

157) The equation  $\theta_2 = \tan^{-1} (\omega C/G)$  gives the phase angle of impedance in the parallel portion of a distributed constant circuit. Find  $\theta_2$  if  $\omega = 140$  radians per second,  $C = 0.05 \mu\text{F}$  per kilometer, and  $G = 1.50 \mu\text{siemens}$  per kilometer.

A)  $88.6^\circ$

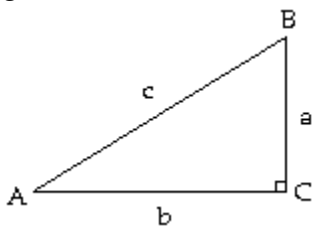
B)  $88.8^\circ$

C)  $80.2^\circ$

D)  $1.4^\circ$

Answer: C

**Solve the right triangle shown in the figure. Round lengths to one decimal place and express angles to the nearest tenth of a degree.**



158)  $A = 38^\circ, b = 42.9$

A)  $B = 52^\circ, a = 54.9, c = 69.7$

C)  $B = 38^\circ, a = 54.9, c = 33.8$

B)  $B = 38^\circ, a = 33.8, c = 33.5$

D)  $B = 52^\circ, a = 33.5, c = 54.4$

Answer: D

159)  $A = 50.2^\circ, c = 55.4$

A)  $B = 39.8^\circ, a = 42.6, b = 35.5$

C)  $B = 39.8^\circ, a = 35.5, b = 42.6$

B)  $B = 50.2^\circ, a = 42.6, b = 35.5$

D)  $B = 50.2^\circ, a = 35.5, b = 42.6$

Answer: A



160)  $B = 39^\circ$ ,  $b = 42.1$

A)  $A = 51^\circ$ ,  $a = 52$ ,  $c = 66.9$

C)  $A = 39^\circ$ ,  $a = 34.1$ ,  $c = 32.7$

B)  $A = 39^\circ$ ,  $a = 34.1$ ,  $c = 66.9$

D)  $A = 51^\circ$ ,  $a = 52$ ,  $c = 54.2$

Answer: A

161)  $b = 220$ ,  $c = 350$

A)  $A = 32.2^\circ$ ,  $B = 57.8^\circ$ ,  $a = 272.2$

C)  $A = 51.1^\circ$ ,  $B = 38.9^\circ$ ,  $a = 413.4$

B)  $A = 51.1^\circ$ ,  $B = 38.9^\circ$ ,  $a = 272.2$

D)  $A = 57.8^\circ$ ,  $B = 32.2^\circ$ ,  $a = 413.4$

Answer: B

162)  $a = 17.6$ ,  $c = 27.8$

A)  $A = 57.7^\circ$ ,  $B = 32.3^\circ$ ,  $b = 32.9$

C)  $A = 39.3^\circ$ ,  $B = 39.3^\circ$ ,  $b = 21.5$

B)  $A = 39.3^\circ$ ,  $B = 50.7^\circ$ ,  $b = 21.5$

D)  $A = 39.3^\circ$ ,  $B = 50.7^\circ$ ,  $b = 32.9$

Answer: B

163)  $a = 3.3$  cm,  $b = 1.5$  cm

A)  $A = 61.1^\circ$ ,  $B = 28.9^\circ$ ,  $c = 3.6$  cm

C)  $A = 24.4^\circ$ ,  $B = 65.6^\circ$ ,  $c = 3.6$  cm

B)  $A = 65.6^\circ$ ,  $B = 24.4^\circ$ ,  $c = 3.6$  cm

D)  $A = 27.0^\circ$ ,  $B = 63.0^\circ$ ,  $c = 4.8$  cm

Answer: B

164)  $a = 3.9$  m,  $B = 28.3^\circ$

A)  $A = 61.7^\circ$ ,  $b = 1$  m,  $c = 4.0$  m

C)  $A = 61.7^\circ$ ,  $b = 4.6$  m,  $c = 4.4$  m

B)  $A = 61.7^\circ$ ,  $b = 2.1$  m,  $c = 4.4$  m

D)  $A = 61.7^\circ$ ,  $b = 4.6$  m,  $c = 6.0$  m

Answer: B

165)  $a = 3.6$  in,  $A = 68.7^\circ$

A)  $b = 1.4$  in,  $B = 21.3^\circ$ ,  $c = 3.9$  in

C)  $b = 0.3$  in,  $B = 21.3^\circ$ ,  $c = 3.6$  in

B)  $b = 3.5$  in,  $B = 21.3^\circ$ ,  $c = 5.0$  in

D)  $b = 3.5$  in,  $B = 21.3^\circ$ ,  $c = 3.9$  in

Answer: A

166)  $B = 28.0^\circ$ ,  $c = 3.6$  mm

A)  $a = 1.7$  mm,  $A = 62.0^\circ$ ,  $b = 3.2$  mm

C)  $a = 2.4$  mm,  $A = 62.0^\circ$ ,  $b = 2.7$  mm

B)  $a = 3.2$  mm,  $A = 62.0^\circ$ ,  $b = 1.7$  mm

D)  $a = 3.2$  mm,  $A = 62.0^\circ$ ,  $b = 2.4$  mm

Answer: B

**Solve the problem.**

167) From a boat on the lake, the angle of elevation to the top of a cliff is  $15^\circ 41'$ . If the base of the cliff is 2573 feet from the boat, how high is the cliff (to the nearest foot)?

A) 725 feet

B) 722 feet

C) 735 feet

D) 732 feet

Answer: B

168) From a boat on the river below a dam, the angle of elevation to the top of the dam is  $32^\circ 46'$ . If the dam is 1312 feet above the level of the river, how far is the boat from the base of the dam (to the nearest foot)?

A) 2028 feet

B) 2008 feet

C) 2038 feet

D) 2018 feet

Answer: C

- 169) A surveyor is measuring the distance across a small lake. He has set up his transit on one side of the lake 140 feet from a piling that is directly across from a pier on the other side of the lake. From his transit, the angle between the piling and the pier is  $70^\circ$ . What is the distance between the piling and the pier to the nearest foot?

A) 385 feet                      B) 48 feet                      C) 132 feet                      D) 51 feet

Answer: A

- 170) A building 150 feet tall casts a 40 foot long shadow. If a person stands at the end of the shadow and looks up to the top of the building, what is the angle of the person's eyes to the top of the building (to the nearest hundredth of a degree)? (Assume the person's eyes are 4 feet above ground level.)

A)  $75.07^\circ$                       B)  $74.68^\circ$                       C)  $74.10^\circ$                       D)  $15.90^\circ$

Answer: B

- 171) A building 180 feet tall casts a 70 foot long shadow. If a person looks down from the top of the building, what is the measure of the angle between the end of the shadow and the vertical side of the building (to the nearest degree)? (Assume the person's eyes are level with the top of the building.)

A)  $23^\circ$                       B)  $21^\circ$                       C)  $69^\circ$                       D)  $67^\circ$

Answer: B

- 172) A radio transmission tower is 240 feet tall. How long should a guy wire be if it is to be attached 5 feet from the top and is to make an angle of  $35^\circ$  with the ground? Give your answer to the nearest tenth of a foot.

A) 293.0 feet                      B) 286.9 feet                      C) 409.7 feet                      D) 418.4 feet

Answer: C

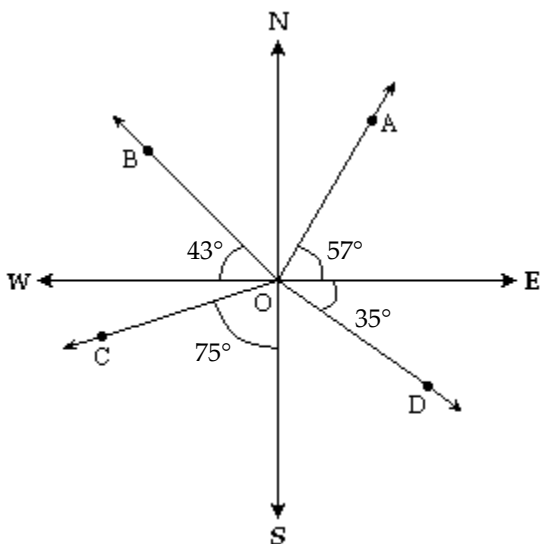
- 173) A straight trail with a uniform inclination of  $15^\circ$  leads from a lodge at an elevation of 500 feet to a mountain lake at an elevation of 9600 feet. What is the length of the trail (to the nearest foot)?

A) 35,160 feet                      B) 9939 feet                      C) 9421 feet                      D) 37,092 feet

Answer: A

**Use the given figure to solve the problem.**

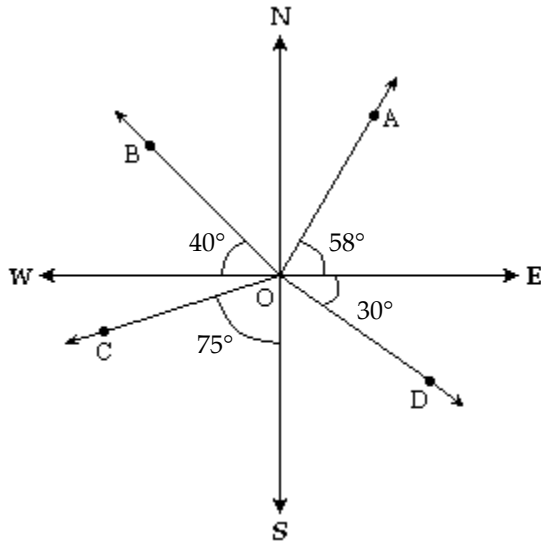
- 174) Find the bearing from O to A.



A) S  $92^\circ$  E                      B) N  $147^\circ$  E                      C) N  $33^\circ$  E                      D) N  $57^\circ$  E

Answer: C

175) Find the bearing from O to B.



A) N 40° W

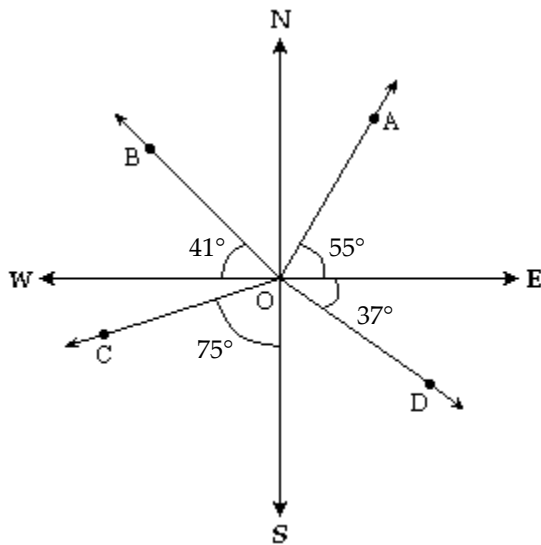
B) S 130° W

C) N 50° E

D) N 50° W

Answer: D

176) Find the bearing from O to C.



A) S 75° W

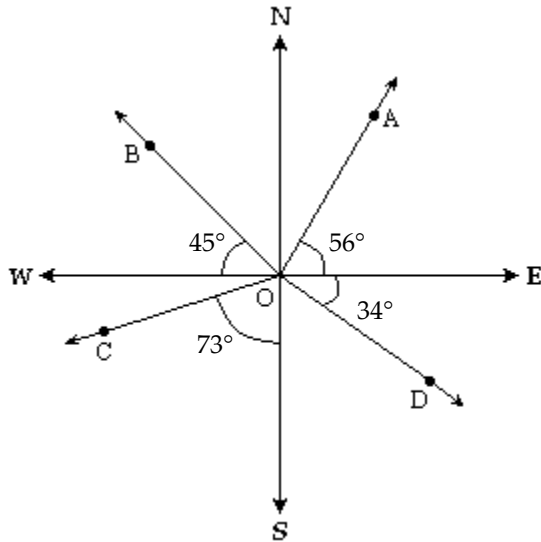
B) S 15° W

C) S 37° E

D) N 145° W

Answer: A

177) Find the bearing from O to D.



- A) S 56° W                      B) N 146° E                      C) S 56° E                      D) N 124° W

Answer: C

**Using a calculator, solve the following problems. Round your answers to the nearest tenth.**

178) A boat leaves the entrance of a harbor and travels 58 miles on a bearing of N 32° E. How many miles north and how many miles east from the harbor has the boat traveled?

- A) 58 miles north and 58 miles east                      B) 92.8 miles north and 36.2 miles east  
 C) 30.7 miles north and 49.2 miles east                      D) 49.2 miles north and 30.7 miles east

Answer: D

179) A ship is 7 miles west and 39 miles south of a harbor. What bearing should the captain set to sail directly to harbor?

- A) N 100.2° E                      B) N 124.8° E                      C) N 10.2° E                      D) N 79.8° E

Answer: C

180) A ship leaves port with a bearing of N 77° W. After traveling 29 miles, the ship then turns 90° and travels on a bearing of S 13° W for 9 miles. At that time, what is the bearing of the ship from port?

- A) N 30.2° W                      B) N 94.2° W                      C) N 59.8° W                      D) N 17.2° W

Answer: B

**An object is attached to a coiled spring. The object is pulled down (negative direction from the rest position) and then released. Write an equation for the distance of the object from its rest position after t seconds.**

181) amplitude = 9 cm; period = 3 seconds

- A)  $d = -9 \sin \frac{2}{3} \pi t$                       B)  $d = -3 \cos \frac{2}{9} \pi t$                       C)  $d = -9 \cos \frac{\pi}{3} t$                       D)  $d = -9 \cos \frac{2}{3} \pi t$

Answer: D

182) amplitude = 13 in.; period = 6 seconds

- A)  $d = -13 \sin \frac{1}{3} \pi t$                       B)  $d = -6 \cos \frac{2}{13} \pi t$                       C)  $d = -13 \cos \frac{1}{3} \pi t$                       D)  $d = -13 \cos \frac{\pi}{6} t$

Answer: C

183) amplitude = 19 cm; period =  $4\pi$  seconds

A)  $d = -19 \cos \frac{1}{2}t$

B)  $d = -19 \sin \frac{1}{2}\pi t$

C)  $d = -19 \cos \frac{1}{2}\pi t$

D)  $d = -4 \cos \frac{2}{19}t$

Answer: A

**An object moves in simple harmonic motion described by the given equation, where  $t$  is measured in seconds and  $d$  in meters . Find the maximum displacement, the frequency, and the time required for one cycle.**

184)  $d = 3 \sin 3t$  meters

A) displacement = 3 meters; period =  $\frac{2}{3} \pi$  seconds;  $f = \frac{3}{2\pi}$  oscillations/second

B) displacement = 3 meters; period =  $\frac{3}{2\pi}$  seconds;  $f = \frac{2}{3} \pi$  oscillations/second

C) displacement = 3 meters; period =  $3 \pi$  seconds;  $f = \frac{3}{\pi}$  oscillations/second

D) displacement = -3 meters; period =  $\frac{2}{3} \pi$  seconds;  $f = \frac{3}{2\pi}$  oscillations/second

Answer: A

185)  $d = -5 \sin 3t$  meters

A) displacement = -5 meters; period =  $3 \pi$  seconds;  $f = \frac{3}{\pi}$  oscillations/second

B) displacement = 5 meters; period =  $\frac{2}{3} \pi$  seconds;  $f = \frac{3}{2\pi}$  oscillations/second

C) displacement = -5 meters; period =  $\frac{2}{3} \pi$  seconds;  $f = \frac{3}{2\pi}$  oscillations/second

D) displacement = 5 meters; period =  $\frac{3}{2\pi}$  seconds;  $f = \frac{2}{3} \pi$  oscillations/second

Answer: B

186)  $d = 6 \cos 5t$  meters

A) displacement = -6 meters; period =  $\frac{2}{5} \pi$  seconds;  $f = \frac{5}{2\pi}$  oscillations/second

B) displacement = 6 meters; period =  $\frac{2}{5} \pi$  seconds;  $f = \frac{5}{2\pi}$  oscillations/second

C) displacement = 6 meters; period =  $5 \pi$  seconds;  $f = \frac{5}{\pi}$  oscillations/second

D) displacement = 6 meters; period =  $\frac{5}{2\pi}$  seconds;  $f = \frac{2}{5} \pi$  oscillations/second

Answer: B

187)  $d = 4 \cos 3\pi t$  meters

- A) displacement = 4 meters; period =  $\frac{2}{3}$  seconds;  $f = \frac{3}{2}$  oscillations/second
- B) displacement = -4 meters; period =  $\frac{3}{2}$  seconds;  $f = \frac{2}{3}$  oscillations/second
- C) displacement = 4 meters; period =  $\frac{3}{2}$  seconds;  $f = \frac{2}{3}$  oscillations/second
- D) displacement = 4 meters; period =  $\frac{2}{3} \pi$  seconds;  $f = \frac{3}{2\pi}$  oscillations/second

Answer: A

188)  $d = 7 + 3 \cos 5\pi t$  meters

- A) displacement = 3 meters; period =  $\frac{2}{5}$  seconds;  $f = \frac{5}{2}$  oscillations/second
- B) displacement = 10 meters; period =  $\frac{2}{5} \pi$  seconds;  $f = \frac{5}{2\pi}$  oscillations/second
- C) displacement = 3 meters; period =  $\frac{5}{2}$  seconds;  $f = \frac{2}{5}$  oscillations/second
- D) displacement = 10 meters; period =  $\frac{2}{5}$  seconds;  $f = \frac{5}{2}$  oscillations/second

Answer: A

**Solve the problem.**

189) An object in simple harmonic motion has a frequency of  $\frac{3}{2}$  oscillations per second and an amplitude of 4 feet.

Write an equation in the form  $d = a \sin \omega t$  for the object's simple harmonic motion.

- A)  $d = 4 \sin 3\pi t$
- B)  $d = 4 \sin \frac{2t}{3}$
- C)  $d = 4 \sin \frac{3\pi t}{2}$
- D)  $d = 4 \sin \frac{3t}{2\pi}$

Answer: A

190) An object has a frequency of 7 vibrations per second. Write an equation in the form  $d = \sin \omega t$  for the object's simple harmonic motion.

- A)  $d = \sin \frac{7}{2}\pi t$
- B)  $d = \sin \frac{7}{\pi}t$
- C)  $d = \sin 14\pi t$
- D)  $d = \sin 14t$

Answer: C

191) A weight attached to a spring is pulled down 4 inches below the equilibrium position. Assuming that the frequency of the system is  $\frac{3}{\pi}$  cycles per second, determine a trigonometric model that gives the position of the weight at time  $t$  seconds.

- A)  $y = -4 \cos \frac{3}{\pi}t$
- B)  $y = -4 \cos 6t$
- C)  $y = 4\pi \cos 3t$
- D)  $y = 4 \cos 6t$

Answer: B