Latorre Calculus Concepts 5e Chapter 1

1. Calculate the output value that corresponds to the given input values of the function.
$s(t) = 3.3t + 8; t = 5, t = 10$

A) $s(5) = 24.5$

$s(10) = 41$

B) $s(5) = 5$

$s(10) = 10$

C) $s(5) = 41$

$s(10) = 24.5$

D) $s(5) = 19.8$

$s(10) = 36.3$

E) $s(5) = 24.5$

$s(10) = 36.3$

Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Easy
Exercise Group: 11-18
Learning Objective: Calculate the output values
Section: 1.1
Similar to Exercise: 1.1.11
Type: Skill

2. Evaluate the function at the given values of the independent variables.
$z = -4x^3 - 2xy - 2y^2; \quad x = -4, y = 7$

A) $z = 214$
B) $z = -106$
C) $z = 166$
D) $z = 144$
E) $z = -374$

Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Easy
Exercise Group: 11-18
Learning Objective: Evaluate a multivariable function
Section: 1.1
Similar to Exercise: 1.1.13
Type: Skill

3. Find the input of the function $f(t) = \dfrac{54}{2e^{-2.5t}+1}$ corresponding to the output $f(t) = 3$ to three decimal places.

A) $t = -0.856$
B) $t = 53.940$
C) $t = -1.879$
D) $t = 2.140$
E) $t = 0.256$

Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 19-26
Learning Objective: Calculate input values
Section: 1.1
Similar to Exercise: 1.1.22
Type: Skill

4. Given $f(x) = e^{3x} - 3$, evaluate $f(-2)$. Round to the nearest ten-thousandth.

A)   426.75
B)   400.429
C)   406.429
D) -2.9975

Ans: D
Format: Multiple Choice
Algorithmic: No
Difficulty: Easy
Exercise Group: 27-34
Learning Objective: Evaluate a function
Section: 1.1
Similar to Exercise: 1.1.29
Type: Skill

5. Find the input of the function $f(x) = 5x + 9$ corresponding to the output $f(x) = -21$.

    A) $x = -2$
    B) $x = -6$
    C) $x = -13$
    D) $x = -150$
    E) $x = -96$

Ans: B
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 27-34
Learning Objective: Calculate input values
Section: 1.1
Similar to Exercise: 1.1.32
Type: Skill

6. The percentage of mothers in a large city who gave birth to a child in 2005 and returned to the workforce within x months of having the child is modeled as

$w(x) = 25.95 + 10.17 \ln x$ percent

What percentage of mothers returned to the workforce within the first year after giving birth?
Round to the nearest thousandth.

    A)   51.222%
    B)   28.435%
    C)   36.925%
    D)   38.980%
    E)   25.272%

Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 42
Learning Objective: Calculate percentage
Section: 1.1
Similar to Exercise: 1.1.42
Type: Application

7. For the given function write limit notation for the end behavior.

$y(x) = 6.5^x$

A) $\lim\limits_{x \to -\infty} y(x) = 0$

   $\lim\limits_{x \to \infty} y(x) = \infty$

B) $\lim\limits_{x \to -\infty} y(x) = \infty$

   $\lim\limits_{x \to \infty} y(x) = 0$

C) $\lim\limits_{x \to -\infty} y(x) = 0$

   $\lim\limits_{x \to \infty} y(x) = 6.5$

D) $\lim\limits_{x \to 0} y(x) = 6.5$

   $\lim\limits_{x \to \infty} y(x) = \infty$

E) $\lim\limits_{x \to -\infty} y(x) = -\infty$

   $\lim\limits_{x \to 0} y(x) = 6.5$

Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 11-18
Learning Objective: Limits and end behavior
Section: 1.2
Similar to Exercise: 1.2.11b
Type: Skill

8. Numerically estimate the limits. Show the numerical estimation table.

$\lim\limits_{x\to\infty}\left(1-0.7^x\right)$; start $x=5$, increment $\times 2$ estimate to the nearest integer.

A)

$x\to\infty$	$1-0.7^x$
5	0.8319
10	0.9718
20	0.9992021
40	0.9999994

$\lim\limits_{x\to\infty}\left(1-0.7^x\right)\approx 1.00$

B)

$x\to\infty$	$1-0.7^x$
5	−2.5000
10	−6.0000
20	−13.0000000
40	−27.0000000

$\lim\limits_{x\to\infty}\left(1-0.7^x\right)=-\infty$

C)

$x\to\infty$	$1-0.7^x$
5	0.0024
10	0.00243
20	1.4641000
40	18.8956800

$\lim\limits_{x\to\infty}\left(1-0.7^x\right)=\infty$

D)

$x\to\infty$	$1-0.7^x$
5	−4.0000
10	−9.0000
20	−19.0000000
40	−39.0000000

$\lim\limits_{x\to\infty}\left(1-0.7^x\right)=-\infty$

E)

$x\to\infty$	$1-0.7^x$
5	0.8319
10	0.9718
20	0.0007979
40	0.9992021

$\lim\limits_{x\to\infty}\left(1-0.7^x\right)\approx 1.00$

Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Difficult
Exercise Group: 19-24
Learning Objective: Limit Estimation
Section: 1.2
Similar to Exercise: 1.2.13c
Type: Skill

9. For the function, write the equations for any horizontal asymptote(s).

$$s(t) = \frac{52}{1+0.3e^{-0.8t}}$$

A) $y = 0$ and $y = 52$
B) $y = 0$ and $y = 3$
C) $y = 80$
D) $y = 0$
E)   no horizontal asymptotes
Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 11-18
Learning Objective: Find horizontal asymptote
Section: 1.2
Similar to Exercise: 1.2.19
Type: Skill

10. Use properties of limits and algebraic methods to find the limit, if it exists.

$$\lim_{x \to 3} (9x^3 - 8x^2 + 4x + 7)$$

A) -190
B) 190
C) 199
D) -199
E)   does not exist
Ans: B
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Easy
Exercise Group: 17-32
Learning Objective: Find slope algebraically
Section: 1.3
Similar to Exercise: 1.3.26
Type: Concept

11. Use properties of limits and algebraic methods to find the limit, if it exists.

$$\lim_{x \to 1/5} \frac{5 - 7x}{225x^2 + 8}$$

A) $-\dfrac{18}{85}$

B) $\dfrac{1}{17}$

C) $-\dfrac{1}{17}$

D) $\dfrac{18}{85}$

E) does not exist

Ans: D
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Easy
Exercise Group: 17-32
Learning Objective: Find limit
Section: 1.3
Similar to Exercise: 1.3.27
Type: Concept

12. Use properties of limits and algebraic methods to find the limit, if it exists.

$$\lim_{x \to 10} \frac{x^2 - 5x - 6}{x^2 - 9x + 18}$$

A) $\quad -\dfrac{11}{7}$

B) $\quad \dfrac{11}{7}$

C) $\quad \dfrac{7}{11}$

D) $\quad -\dfrac{7}{11}$

E) $\quad$ does not exist

Ans: B

Format: Multiple Choice

Algorithmic: Yes

Difficulty: Easy

Exercise Group: 17-32

Learning Objective: Find slope algebraically

Section: 1.3

Similar to Exercise: 1.3.29

Type: Skill

13. Use properties of limits and algebraic methods to find the limit, if it exists.

$$\lim_{x \to -5} \frac{x^2 + 13x + 42}{x^2 + 6x}$$

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

B) $-\dfrac{2}{5}$

C) $-\dfrac{5}{2}$

D) $\dfrac{5}{2}$

E) does not exist

Ans: B
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Easy
Exercise Group: 17-32
Learning Objective: Find slope algebraically
Section: 1.3
Similar to Exercise: 1.3.30
Type: Skill

14. Complete the table and use it to predict the limit, if it exists.

$$f(x) = \begin{cases} 9x - 1 & \text{for } x < 1 \\ 2 - 2x - x^2 & \text{for } x \geq 1 \end{cases}$$

$$\lim_{x \to 1} f(x) = ?$$

x	$f(x)$
0.9	
0.99	
0.999	
↓	↓
1	?
↑	↑
1.001	
1.01	
1.1	

A) −8
B) 8
C) −1
D) 1
E) does not exist
Ans: E
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 33-36
Learning Objective: Find slope numerically
Section: 1.3
Similar to Exercise: 1.3.33
Type: Concept

15. Use properties of limits and algebraic methods to find the limit, if it exists.

$$\lim_{x \to 7} f(x), \text{ where } f(x) = \begin{cases} 15 - 2x & \text{for } x < 7 \\ x^2 - 9x & \text{for } x \geq 7 \end{cases}$$

A) -1
B)   14
C) -14
D)   1
E)   does not exist
Ans: E
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 33-36
Learning Objective: Find limit
Section: 1.3
Similar to Exercise: 1.3.34
Type: Skill

16. Write a linear model for the given rate of change and initial output value.
The cost to produce plastic toys increases by 10 cents per toy produced. The fixed cost is 90 dollars.

A) $C(x) = 0.9x + 90$

B) $C(x) = 0.1x + 90$

C) $C(x) = 10x + 90$

D) $C(x) = 90x + 0.1$

E) $C(x) = 0.1x + 0.9$

Ans: B
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Easy
Exercise Group: 7-12
Learning Objective: Write a linear model for the given rate of change and initial output value.
Section: 1.4
Similar to Exercise: 1.4.7
Type: Application

17. Calculate the average rate of change in the population (in people per month) between April, 1999, and July, 2001.

Date	Population (in thousands)
April 1999	876.0
July 2001	780.2

A) −3548 people per month
B) −3992 people per month
C) −19,160 people per month
D) −2903 people per month
E) −8709 people per month
Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 20
Learning Objective: Average Rate of Change of a Data Set
Section: 1.4
Similar to Exercise: 1.4.20a
Type: Application

18. Calculate the constant percentage change for the given function.
$f(x) = 72(1.15^x)$

A) 15%
B) 0.15%
C) 72%
D) 82.8%
E) 10.8%
Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 5-8
Learning Objective: Calculate constant percentage change
Section: 1.5
Similar to Exercise: 1.5.5b
Type: Skill

19. How much money would you have to invest today at 6% APR compounded monthly to accumulate the sum of $270,000 in 37 years?
Round to the nearest hundredth.
- **A)** $29,487.12
- **B)** $208,321.77
- **C)** $22,500.00
- **D)** $18,708.47
- **E)** $31,264.16

Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 11
Learning Objective: Compund Interest
Section: 1.6
Similar to Exercise: 1.5.9
Type: Application

20.
Use the formula $2 = \left(1 + \dfrac{r}{100n}\right)^{nt}$ to find the doubling time t, in years, for an investment at r% compounded n times per year. Suppose you make an investment of $1300 at interest rate 12% compounded quarterly. How long will it take for your investment to double?
- **A)** 3.06 years
- **B)** 1.95 years
- **C)** 11.72 years
- **D)** 0.76 years
- **E)** 5.86 years

Ans: E
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Difficult
Exercise Group: 30
Learning Objective: Find doubling time
Section: 1.5
Similar to Exercise: 1.5.30
Type: Concept

21. Calculate the total amount due after two years on a loan of $1100 with a simple interest charge of 7%.
   A) $1254
   B) $1204
   C) $1304
   D) $1354
   E) $1154
Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 1
Learning Objective: Calculate the total amount using simple interest
Section: 1.6
Similar to Exercise: 1.6.1
Type: Application

22. To offset college expenses, at the beginning of your freshman year you obtain a nonsubsidized student loan for $18,000. Interest on this loan accrues at a rate of 3.15% compounded monthly. However, you do not have to make any payments against either the principal or the interest until after you graduate.
Write a model giving the total amount you will owe on this loan after t years in college.

A)
$$F(t) = 18000\left(1 + \frac{0.0315}{12}\right)^{12t}$$

B)
$$F(t) = 0.0315\left(1 + \frac{18000}{12}\right)^{12t}$$

C)
$$F(t) = 18000\left(1 - \frac{0.0315}{12}\right)^{12t}$$

D)
$$F(t) = 0.0315\left(1 + \frac{18000}{12t}\right)^{12}$$

E)
$$F(t) = 18000\left(1 - \frac{0.0315}{12t}\right)^{12}$$

Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Easy
Exercise Group: 3
Learning Objective: Compound interest
Section: 1.6
Similar to Exercise: 1.6.3a
Type: Application

23. Your credit card statement indicates a finance charge of 20.00 % per month on the outstanding balance. What is the effective rate of interest (APY) to the nearest hundredth?

A) 20.00 %
B) 21.94 %
C) 21.67 %
D) 240.00 %
E) 1.67 %
Ans: B
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 5
Learning Objective: Calculate APY rates
Section: 1.6
Similar to Exercise: 1.6.5b
Type: Application

24. How long would it take an investment to double if the interest rate is 4.2%, compounded monthly? Round your answer to two decimal places.

A) 16.85 years
B) 0.48 year
C) 17.68 years
D) 16.53 years
E) 1.38 years
Ans: D
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 7
Learning Objective: Calculate doubling rate
Section: 1.6
Similar to Exercise: 1.6.7a
Type: Application

25. In 1990, there were 2 women among the CEOs of Fortune 500 companies. In 2009, this number had risen to 18 women.
What was the percentage change in the number of Fortune 500 women CEOs between 1990 and 2009?
A) 800%
B) 8%
C) 180%
D) 20%
E) 91%
Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 9
Learning Objective: Percentage change
Section: 1.5
Similar to Exercise: 1.6.11
Type: Application

26. The total cost for producing x units of a commodity is $4.8 million, and the revenue generated by the sale of x units is $7.4 million. What is the profit on x units of the commodity?
A) $12.2 million
B) $1.5 million
C) $2.6 million
D) $4.8 million
E) $7.4 million
Ans: C
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Difficult
Exercise Group: 5
Learning Objective: Calculate profit
Section: 1.7
Similar to Exercise: 1.7.5
Type: Application

27. It cost a company $6.75 to produce 75 glass bottles. What was the average cost of production of a glass bottle to the nearest cent?
  A) $0.07
  B) $0.75
  C) $0.14
  D) $40.88
  E) $0.09
  Ans: E
  Format: Multiple Choice
  Algorithmic: Yes
  Difficulty: Difficult
  Exercise Group: 10
  Learning Objective: Calculate the unit price
  Section: 1.7
  Similar to Exercise: 1.7.10
  Type: Application

28. Write the product of the two functions. Evaluate the constructed function at 2.
  $f(x) = 3(1.6^x); \; h(x) = 8x^{2.5}$
  A) $(j \cdot h)(x) = 24(1.6^x)(x^{2.5})$

  $(j \cdot h)(2) \approx 695.114$
  B) $(j \cdot h)(x) = 24(1.6^x)$

  $(j \cdot h)(2) \approx 173.779$
  C) $(j \cdot h)(x) = 24(1.6^x)(x^{2.5})$

  $(j \cdot h)(2) \approx 347.557$
  D) $(j \cdot h)(x) = 24(1.6^x)(x^{2.5})$

  $(j \cdot h)(2) \approx 352.557$
  E) $(j \cdot h)(x) = 24(x^{2.5})$

  $(j \cdot h)(2) \approx 342.557$
  Ans: A
  Format: Multiple Choice
  Algorithmic: Yes
  Difficulty: Medium
  Exercise Group: 17-20
  Learning Objective: Write the product of the two functions
  Section: 1.7
  Similar to Exercise: 1.7.18c
  Type: Skill

29. Rewrite the following pair of functions as one composite function.

$f(t) = 4e^t \,; t(p) = -3p^4$

A) $4e^{-3p^4}$

B) $-12e^{t^4}$

C) $-12e^{p^4}$

D) $4e^p$

E) $-3(4e^t)^2$

Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 25-28
Learning Objective: Compose functions
Section: 1.7
Similar to Exercise: 1.7.25
Type: Skill

30. Rewrite the following pair of functions as one composite function.

$g(x) = \sqrt{3x^2} \,; x(w) = 3e^w$

A) $\sqrt{27e^{w^2}}$

B) $\sqrt{3w^2}$

C) $\sqrt{9e^{w^2}}$

D) $\sqrt{9e^w}$

E) $\sqrt{27e^{2w}}$

Ans: E
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 25-28
Learning Objective: Compose functions
Section: 1.7
Similar to Exercise: 1.7.27
Type: Skill

31. Choose the function type for the mathematical model that best represents the given data set.

x:	0	1	2	3	4
$f(x)$:	16.33	12.54	16.56	27.72	48.40

A) logistic
B) quadratic
C) linear
D) exponential
E) logarithmic
Ans: B
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 17
Learning Objective: Model data sets
Section: 1.9
Similar to Exercise: 1.9.54
Type: Application

32. Find the equation of the quadratic function that is the best fit for the given data.

x	y
-2	9.4
-1	2
0	-2.2
1	-2.5
2	1.9
3	9.8
4	21.6

A) $y = 1.88x^2 - 2.13x - 2.51$

B) $y = 1.78x^2 - 2.04x - 2.36$

C) $y = 2.17x^2 - 1.84x - 2.2$

D) $y = 2.07x^2 - 1.75x - 2.01$

E) $y = 1.98x^2 - 1.94x - 2.22$

Ans: E
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 19
Learning Objective: Model data sets
Section: 1.9
Similar to Exercise: 1.9.19
Type: Skill

33. Indicate whether the function is an increasing or decreasing logistic function and identify the upper limiting value of the function $f(x) = \dfrac{68}{1 + 18e^{-0.66x}}$

    A)   The function is increasing and the upper limit is 18.00.
    B)   The function is decreasing and the upper limit is 18.00.
    C)   The function is increasing and the upper limit is 68.00.
    D)   The function is decreasing and the upper limit is 68.00.
    E)   The function is decreasing and the upper limit is 0.00.
Ans: C
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 11-14
Learning Objective: Calculate the upper limit of a logistic function
Section: 1.10
Similar to Exercise: 1.10.11
Type: Concept

34. Indicate whether the function is an increasing or decreasing logistic function and identify the upper limiting value of the function $A(t) = \dfrac{29}{1 + 18e^{2.37t}}$.

    A)   The function is decreasing and the upper limit is 29.00.
    B)   The function is decreasing and the upper limit is 2.37.
    C)   The function is decreasing and the upper limit is –2.37.
    D)   The function is increasing and the upper limit is 0.00.
    E)   The function is increasing and the upper limit is 29.00.
Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 11-14
Learning Objective: Calculate the upper limit of a logistic function
Section: 1.10
Similar to Exercise: 1.10.12
Type: Concept

35. Indicate whether the function is an increasing or decreasing logistic function and identify the upper limiting value of the function $f(x) = \dfrac{4.2}{1 + 2.7e^{-0.4x}}$.

A) The function is decreasing and the upper limit is 2.7.
B) The function is decreasing and the upper limit is –0.4.
C) The function is decreasing and the upper limit is 0.4.
D) The function is increasing and the upper limit is 4.2.
E) The function is increasing and the upper limit is 0.0.
Ans: D
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 11-14
Learning Objective: Calculate the upper limit of a logistic function
Section: 1.10
Similar to Exercise: 1.10.13
Type: Concept

36. The following table gives the percent of the U.S. population with Internet connections for the years 1997 to 2003. Use a calculator to find the logistic function that models these data. Use x as the number of years past 1995.

Year	1997	1998	1999	2000	2001	2002	2003
Percent with Internet	22.2	32.7	39.1	44.4	53.9	55.0	56.0

Source: U.S. Department of Commerce

A)
$$y(x) = \frac{59.57}{1+5.22e^{-0.585x}}$$

B)
$$y(x) = \frac{22.2}{1+5.85e^{-0.618x}}$$

C)
$$y(x) = \frac{56.0}{1+5.5e^{-0.522x}}$$

D)
$$y(x) = \frac{1}{1+5.5e^{-0.618x}}$$

E)
$$y(x) = \frac{56.0}{1+5.95e^{-0.585x}}$$

Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Difficult
Exercise Group: 18
Learning Objective: Find logistic model
Section: 1.10
Similar to Exercise: 1.10.18
Type: Application

37. In 1996, the population of a country was estimated at 4 million. For any subsequent year the population $P(t)$ in millions is

$$P(t) = \frac{240}{5 + 54.99e^{-0.0208t}}$$

where t is the number of years since 1996. Use a graphing calculator to estimate the population in 2005.

A) 4,743,000
B) 4,699,000
C) 4,655,000
D) 4,833,000

Ans: A
Format: Multiple Choice
Algorithmic: No
Difficulty: Easy
Exercise Group: 19-21
Learning Objective: Find value of logisitic function
Section: 1.10
Similar to Exercise: 1.10.19
Type: Application

38. A chemical reaction begins when a certain mixture reaches $95°$C. The reaction activity is measured in units (U) per 100 microliters $(100\mu L)$ of the mixture. Measurements during the first 18 minutes after the mixture reaches $95°$C are listed in the accompanying table. Estimate the limiting value.

Time (minutes)	Activity $(U/100\mu L)$	Time (minutes)	Activity $(U/100\mu L)$
0	1.93	10	3.68
2	2.49	12	3.76
4	2.97	14	3.80
6	3.31	16	3.83
8	3.54	18	3.84

A) 3.86
B) 1.93
C) 4.06
D) 3.83
E) 1.73

Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Difficult
Exercise Group: 19-21
Learning Objective: Estimate limits from data
Section: 1.10
Similar to Exercise: 1.10.20
Type: Application

39. The table gives the percent of the population of a certain city that was foreign born in the given year. Find a cubic function that best fits the data where x is the number of years after 1900 and y is equal to the percent. By trial and error, estimate the year the model predicts that the foreign-born population will be 100%.

Year	Percent Foreign Born
1900	10.5
1910	16.7
1920	9
1930	7.5
1940	9.7
1950	15.7

A) $y = 0.0008x^3 - 0.0494x^2 + 0.6929x + 11.3143$

foreign born population will be 100% in 1965.

B) $y = 0.0008x^3 - 4.3244x^2 + 8310.75x - 5323734.4$

foreign born population will be 100% in 1975.

C) $y = 0.0008x^3 - 0.0494x^2 + 0.6929x + 11.3143$

foreign born population will be 100% in 1975.

D) $y = 0.0008x^3 - 4.3244x^2 + 8310.75x - 5323734.4$

foreign born population will be 100% in 1965.

E) $y = 0.0008x^3 - 0.0494x^2 + 0.6929x + 11.3143$

foreign born population will be 100% in 1985.

Ans: C
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 15
Learning Objective: Model data sets
Section: 1.11
Similar to Exercise: 1.11.15b
Type: Application

40. What is the period of the following function?

$$f(x) = -9\sin\left(\frac{\pi}{7}x - 8\pi\right) - 2$$

A) 14
B) 56
C) 2
D) 9
E) 11
Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 5-12
Learning Objective: Calculate the period of a sine function
Section: 1.12
Similar to Exercise: 1.12.5
Type: Skill

41. Find the amplitude of the following function. Round to two decimal places.

$$y = 2\sin 5t$$

A) 5.00
B) 2.00
C) 1.26
D) 3.14
E) 4.00
Ans: B
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Easy
Exercise Group: 5-12
Learning Objective: Graph sine and cosine functions
Section: 1.12
Similar to Exercise: 1.12.6
Type: Skill

42. What is the amplitude of the following function?

$$f(x) = -\sin\left(\frac{\pi}{5}x - \pi\right) + 7$$

A) 5
B) 7
C) 10
D) 1
E) −1

Ans: D
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 5-12
Learning Objective: Calculate the amplitude of a sine function
Section: 1.12
Similar to Exercise: 1.12.7
Type: Skill

43. Find the amplitude of the following function. Round to two decimal places.

$$y = -5\cos 3t + 3\cos 3t$$

A) 3.00
B) 8.00
C) 5.00
D) 0.00
E) 2.00

Ans: E
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 5-12
Learning Objective: Graph sine and cosine functions
Section: 1.12
Similar to Exercise: 1.12.8
Type: Skill

44. What is the horizontal shift of the following function?

$$f(x) = -4\sin\left(\frac{\pi}{3}x - \pi\right) - 8$$

A) right 1π
B) left 8
C) right 3
D) left 1π
E) left 3
Ans: C
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 5-12
Learning Objective: Calculate the horizontal shift of a sine function
Section: 1.12
Similar to Exercise: 1.12.9
Type: Skill

45. Find the period of the following function. Round to two decimal places.

$y = 4\cos t$

A) 1.00
B) 6.28
C) 4.00
D) 1.57
E) 8.00
Ans: B
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Easy
Exercise Group: 5-12
Learning Objective: Graph sine and cosine functions
Section: 1.12
Similar to Exercise: 1.12.11
Type: Skill

46. The table below gives the normal daily mean temperatures, based on a 30-year period 1961 through 1990, for a certain city. Use the data to estimate the amplitude to the nearest degree.

Month	Daily mean temperature (°F)	Month	Daily mean temperature (°F)
Jan	16.7	July	82.3
Feb	30.6	Aug	68.5
Mar	49.5	Sep	49.5
Apr	68.5	Oct	30.5
May	82.3	Nov	16.7
June	87.4	Dec	11.6

A) $38°F$
B) $19°F$
C) $50°F$
D) $3°F$
E) $2°F$
Ans: A
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 17
Learning Objective: Estimate the amplitude of a cyclical function from a table of data
Section: 1.12
Similar to Exercise: 1.12.17a
Type: Application

47. The table below gives the normal daily mean temperatures, based on a 30-year period 1961 through 1990, for a certain city. Use the data to estimate the period.

Month	Daily mean temperature (°F)	Month	Daily mean temperature (°F)
Jan	10.6	July	89.2
Feb	15.9	Aug	83.9
Mar	30.3	Sep	69.5
Apr	49.9	Oct	49.9
May	69.6	Nov	30.3
June	83.9	Dec	15.9

A) 11 months
B) 2 months
C) 4 months
D) 12 months
E) 360 months
Ans: D
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Medium
Exercise Group: 17
Learning Objective: Estimate the period of a cyclical function from a table of data
Section: 1.12
Similar to Exercise: 1.12.17c
Type: Application

48. Some populations of animals exhibit periodic behavior over time. During the 1960s and 1970s, two scientists carefully studied the population of the Carabid beetle in a region of the Netherlands. Assume that the table below shows the results from their study. Renumber the input data as years since 1965. Using only the data, estimate the horizontal shift, where a shift of zero corresponds to the year 1964. Round your answer to the nearest year.

Year	Number of Beetles (in thousands)	Year	Number of Beetles (in thousands)
1965	36.2	1971	65.8
1966	17.9	1972	36.2
1967	24.4	1973	17.9
1968	51.0	1974	24.4
1969	77.6	1975	51.0
1970	84.1	1976	77.6

A)   4 years
B)   34 years
C)   7 years
D)   5 years
E)   3 years
Ans: E
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Difficult
Exercise Group: 21
Learning Objective: Estimate the horizontal shift of a cyclical function from a table of data
Section: 1.12
Similar to Exercise: 1.12.21
Type: Application

49. Some populations of animals exhibit periodic behavior over time. During the 1960s and 1970s, two scientists carefully studied the population of the Carabid beetle in a region of the Netherlands. Assume that the table below shows the results from their study. Without the aid of technology, choose the sine model which is the most reasonable fit to data, where x is the number of years since 1964.

Year	Number of Beetles (in thousands)	Year	Number of Beetles (in thousands)
1965	71.6	1971	92.7
1966	37.8	1972	71.6
1967	16.7	1973	37.8
1968	24.2	1974	16.7
1969	54.7	1975	24.2
1970	85.2	1976	54.7

A) $N(x) = 78.0\sin(0.90x + 1.80) + 27.4$

B) $N(x) = 78.0\sin(1.80x + 0.90) + 54.7$

C) $N(x) = 39.0\sin(0.90x + 1.80) + 54.7$

D) $N(x) = 19.5\sin(1.80x + 0.90) + 27.4$

E) $N(x) = 19.5\sin(0.90x + 1.80) + 109.4$

Ans: C
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Difficult
Exercise Group: 26
Learning Objective: Construct a sine model from a table of data
Section: 1.12
Similar to Exercise: 1.12.26b
Type: Application

50. The table below gives the normal daily mean temperatures, based on a 30-year period 1961 through 1990, for a certain city. Which of the following sine models best represents the mean daily temperature, where x denotes the number of the month in a calendar year.

Month	Daily mean temperature (°F)	Month	Daily mean temperature (°F)
Jan	18.6	July	88.1
Feb	23.2	Aug	83.5
Mar	35.9	Sep	70.6
Apr	53.3	Oct	53.5
May	70.5	Nov	36.2
June	83.1	Dec	23.3

A) $T(x) = 53.1\sin(0.52x - 2.09) + 34.6$

B) $T(x) = 63.7\sin(-2.09x - 0.52) + 27.7$

C) $T(x) = 34.6\sin(0.52x - 2.09) + 53.1$

D) $T(x) = 41.5\sin(0.52x - 2.09) + 42.5$

E) $T(x) = 53.1\sin(-2.09x - 0.52) + 53.1$

Ans: C
Format: Multiple Choice
Algorithmic: Yes
Difficulty: Difficult
Exercise Group: 28
Learning Objective: Construct a sine model from a table of data
Section: 1.12
Similar to Exercise: 1.12.28b
Type: Application