Name: _____ Date: _____

Chapter 2: Polynomial and Rational Functions

1. Use long division to divide.

$$\left(x^4 - x^2 - 5\right) \div \left(x^2 + 4x - 1\right)$$

A) $x^2 - 4x + 4$

B) $x^2 + 4x - 4$

C) $x^2 - 4x + 16 + \dfrac{-68x + 11}{x^2 + 4x - 1}$

D) $x^2 + 4x - 4 + \dfrac{-5x - 1}{x^2 + 4x - 1}$

E) $x^2 - 4x + 4 - \dfrac{4}{x^2 - 4x + 4}$

2. Write $f(x) = x^4 - 12x^3 + 59x^2 - 138x + 130$ as a product of linear factors.

A) $(x-3-i)(x-3+2\,i)(x-3-2\,i)(x-2+i)$

B) $(x-3-i)(x-3+i)(x-2-i)(x-2+i)$

C) $(x-3-i)(x-3+i)(x+3-2\,i)(x-2+i)$

D) $(x-3+i)(x-3-i)(x-2+3i)(x-2-3i)$

E) $(x-3+i)(x-3-i)(x-3+2i)(x-3-2i)$

3. Find the zeros of the function below algebraically, if any exist.

$$f(x) = x^5 - 5x^3 + 4x$$

A) –4, –1, 1, 4

B) –4, –2, 2, 4

C) –2, –1, 0, 1, 2

D) –4, –2, 0, 2, 4

E) No zeros exist.

4. Find two positive real numbers whose product is a maximum and whose sum of the first number and four times the second is 200.

A) $160, 10$
B) $116, 21$
C) $108, 23$
D) $100, 25$
E) $76, 31$

5. Determine the equations of any horizontal and vertical asymptotes of $f(x) = \dfrac{x^2}{x^2 + 16}$.

A) horizontal: $y = 4$; vertical: $x = -4$
B) horizontal: $x = 1$; vertical: none
C) horizontal: $y = -4$; vertical: $x = 1$
D) horizontal: $y = 1$; vertical: none
E) horizontal: none; vertical: none

6. Find a polynomial function with following characteristics.

Degree: 4
Zero: -1, multiplicity: 2
Zero: -3, multiplicity: 2
Falls to the left,
Falls to the right
Absolute value of the leading coefficient is one

A) $y = x^4 - 4x^3 + 22x^2 + 24x + 3$
B) $y = -x^4 - 4x^3 + 12x^2 + 9$
C) $y = x^4 - 6x^3 - 18x^2 + 10x + 3$
D) $y = -x^4 - 8x^3 - 22x^2 - 24x - 9$
E) $y = -x^4 - 8x^3 - 24x + 9$

7. A polynomial function f has degree 3, the zeros below, and a solution point of $f(-3) = -4$. Write f in completely factored form.

$-4, \ -3 + 2i$

A) $f(x) = (x + 3)(x + 4 - 2i)(x + 4 + 2i)$
B) $f(x) = -(x + 4)(x + 2 - 3i)(x + 2 + 3i)$
C) $f(x) = (x + 4)(x + 2 - 3i)(x + 2 + 3i)$
D) $f(x) = -(x + 4)(x + 3 - 2i)(x + 3 + 2i)$
E) $f(x) = (x + 4)(x + 3 - 2i)(x + 3 + 2i)$

8. The interest rates that banks charge to borrow money fluctuate with the economy. The interest rate charged by a bank in a certain country is given in the table below. Let t represent the year, with $t = 0$ corresponding to 1986. Use the *regression* feature of a graphing utility to find a quadratic model of the form $y = at^2 + bt + c$ for the data.

Year t	Percent y
1986	12.4
1988	9.7
1990	7.3
1992	6.3
1994	9.7
1996	11.6

A) $y = -2.13t^2 + 12.61t + 0.21$

B) $y = 12.61t^2 + 0.21t - 2.13$

C) $y = 0.21t^2 - 2.13t + 12.61$

D) $y = 0.17t^2 - 2.58t + 10.59$

E) $y = 0.25t^2 - 1.73t + 14.37$

9. Find the zeros of the function below algebraically, if any exist.

$$f(x) = 25x^3 - 60x^2 + 36x$$

A) $-\frac{6}{5}$ and 0

B) 0 and $\frac{6}{5}$

C) $-\frac{6}{5}$, 0, and $\frac{6}{5}$

D) $-\frac{6}{5}$ and $\frac{6}{5}$

E) No zeros exist.

10. Determine the zeros (if any) of the rational function $f(x) = \frac{x^2 - 64}{x + 5}$.

A) $x = -5$

B) $x = -\frac{8}{5}, x = \frac{8}{5}$

C) $x = -64, x = 64$

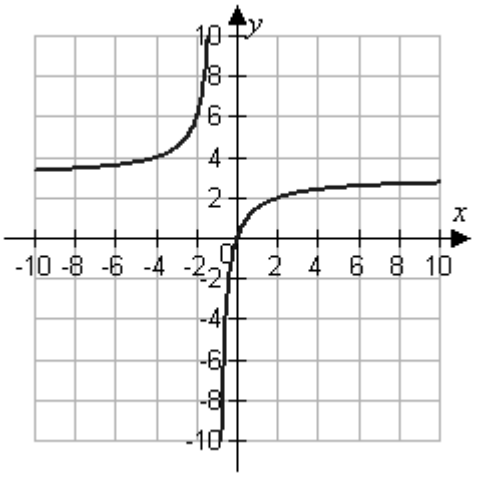
D) $x = -8, x = 8$

E) no zeros

11. The graph of the function

$$f(x) = \frac{3x}{x+1}$$

is shown below. Determine the domain.

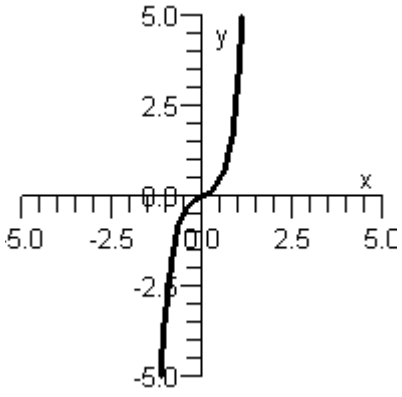


A) Domain: all real numbers except $x = -1$
B) Domain: all real numbers except $x = -1$ and $x = 0$
C) Domain: all real numbers except $x = -1$ and $x = 3$
D) Domain: all real numbers except $x = 3$
E) Domain: all real numbers except $x = 0$

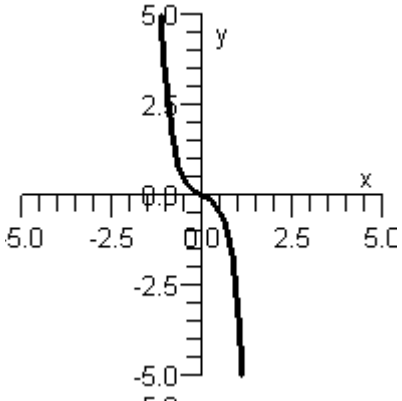
12. Which of the given graphs is the graph of the polynomial function below?

$$h(x) = x^5 - \frac{3}{2}x^3 - \frac{1}{2}x$$

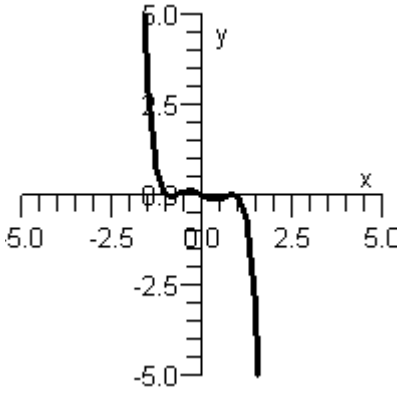
Graph 1 :



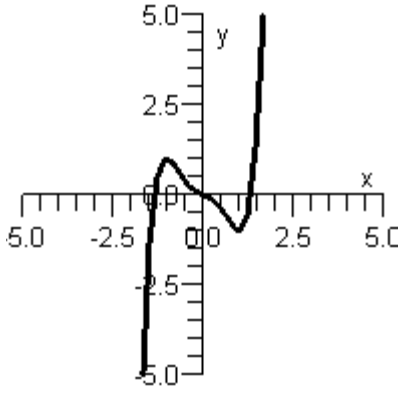
Graph 2 :



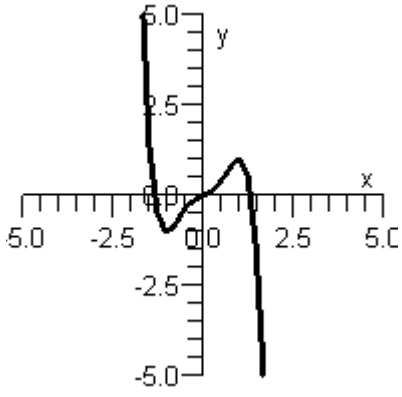
Graph 3 :



Graph 4 :



Graph 5 :



A) Graph 2
B) Graph 5
C) Graph 4
D) Graph 1
E) Graph 3

13. Perform the addition or subtraction and write the result in standard form.

$$-(7.2-12.3\,i)-\left(8.1-\sqrt{-1.21}\right)$$

A) $-15.3+13.4i$
B) $0.9+13.4i$
C) $-0.9+11.2i$
D) $-15.3+11.2i$
E) $15.3+13.4i$

14. Find a fifth degree polynomial function of the lowest degree that has the zeros below and whose leading coefficient is one.

$$-3,\ -1,\ 0,\ 1,\ 3$$

A) $f(x) = x^5 + 7x^4 - 19x^3 - 32x^2 + 48x$

B) $f(x) = x^5 + 7x^4 - 19x^3 + 32x^2 + 48x$

C) $f(x) = x^5 + 4x^4 - 13x^3 + 3x^2 + 12x$

D) $f(x) = x^5 + 5x^4 - 13x^3 + 27x^2 + 36x$

E) $f(x) = x^5 - 10x^3 + 9x$

15. Find the zeros of the function below algebraically, if any exist.

$$f(x) = x^6 - 9x^3 + 8$$

A) 1 and 2

B) –4 and 1

C) –4 and 2

D) –4, –1, 1, and 4

E) –4, –2, 2, and 4

16. Identify any horizontal and vertical asymptotes of the function below.

$$f(x) = \frac{2x - 8}{|x| + 6}$$

A) vertical asymptotes: $x = -2$ and $x = 2$; horizontal asymptotes: $y = -6$ and $y = 6$

B) vertical asymptotes: $x = -2$ and $x = 2$; horizontal asymptotes: none

C) vertical asymptotes: $x = -6$ and $x = 6$; horizontal asymptotes: none

D) vertical asymptotes: none; horizontal asymptotes: $y = -2$ and $y = 2$

E) vertical asymptotes: $x = -6$ and $x = 6$; horizontal asymptotes: $y = -2$ and $y = 2$

17. Find all the rational zeros of the function $f(x) = -2x^5 - 11x^4 - 19x^3 - 17x^2 - 17x - 6$.

A) $x = \frac{1}{2}, -3, -1$

B) $x = -\frac{2}{3}, 1, -2$

C) $x = -\frac{1}{2}, \frac{3}{2}, -2$

D) $x = -\frac{1}{2}, \frac{3}{2}$

E) $x = -\frac{1}{2}, -3, -2$

18. Find real numbers a and b such that the equation $a + bi = -10 + 10i$ is true.

A) $a = 10,\ b = -10$

B) $a = -10,\ b = -10$

C) $a = 10,\ b = 10$

D) $a = -10,\ b = 10$

E) $a = -20,\ b = 0$

19. Use long division to divide.

$$\left(x^3 + 3x^2 + x + 3\right) \div \left(x + 3\right)$$

A) $x^2 + 3$

B) $x^2 + 6x + 17 - \frac{53}{x+3}$

C) $x^2 + 6x + 19 + \frac{48}{x+3}$

D) $x^2 + 6x + 17$

E) $x^2 + 1$

20. Find two positive real numbers whose product is a maximum and whose sum is 146.

A) 71, 75

B) 73, 73

C) 78, 68

D) 82, 64

E) 61, 85

Answer Key

1. C
2. E
3. C
4. D
5. D
6. D
7. D
8. C
9. B
10. D
11. A
12. C
13. A
14. E
15. A
16. D
17. E
18. D
19. E
20. B

Name: _____ Date: _____

1. Describe the right-hand and the left-hand behavior of the graph of $t(x) = -\frac{4}{7}\left(x^3 + 5x^2 + 8x + 1\right)$.

   A) Because the degree is odd and the leading coefficient is positive, the graph falls to the left and falls to the right.

   B) Because the degree is odd and the leading coefficient is negative, the graph rises to the left and falls to the right.

   C) Because the degree is odd and the leading coefficient is negative, the graph falls to the left and rises to the right.

   D) Because the degree is odd and the leading coefficient is positive, the graph rises to the left and rises to the right.

   E) Because the degree is even and the leading coefficient is negative, the graph rises to the left and falls to the right.

2. If $x = \frac{2}{5}$ is a root of $25x^3 - 70x^2 + 44x - 8 = 0$, use synthetic division to factor the polynomial completely and list all real solutions of the equation.

   A) $(5x-2)(5x+2)(x-2);\ x = \frac{2}{5}, -\frac{2}{5}, 2$

   B) $(5x+2)^2(x-2);\ x = -\frac{2}{5}, 2$

   C) $(5x-2)(x-2)^2;\ x = \frac{2}{5}, 2$

   D) $(5x+2)(x-2)^2;\ x = -\frac{2}{5}, 2$

   E) $(5x-2)^2(x-2);\ x = \frac{2}{5}, 2$

3. Simplify $(3-6i)^2 - (3+6i)^2$ and write the answer in standard form.

   A) 0

   B) $-72i$

   C) $18 - 72i$

   D) $18 + 72i$

   E) $6 - 24i$

4. Determine the domain of $f(x) = \dfrac{6x+6}{x^2-6x}$.

   A) all real numbers except $x = -1$, $x = 0$, and $x = 6$
   B) all real numbers except $x = 0$ and $x = 6$
   C) all real numbers except $x = -6$ and $x = -1$
   D) all real numbers except $x = 6$
   E) all real numbers

5. Suppose the IQ scores (y, rounded to the nearest 10) for a group of people are summarized in the table below. Use the *regression* feature of a graphing utility to find a quadratic function of the form $y = ax^2 + bx + c$ for the data.

IQ Score y	Number of People x
70	50
80	76
90	89
100	93
110	74
120	53
130	16

   A) $y = -0.04x^2 + 15.08x - 411.58$
   B) $y = -0.06x^2 + 12.06x - 484.21$
   C) $y = -0.08x^2 + 10.98x - 508.43$
   D) $y = -0.07x^2 + 13.63x - 460$
   E) $y = -0.09x^2 + 8.56x - 556.85$

6. Simplify f below and find any vertical asymptotes of f.

$$f(x) = \frac{x^2 - 25}{x + 5}$$

   A) $f(x) = x + 5,\ x \neq 5;$ vertical asymptotes: none
   B) $f(x) = x - 5,\ x \neq -5;$ vertical asymptotes: none
   C) $f(x) = x - 5,\ x \neq 5;$ vertical asymptotes: none
   D) $f(x) = x + 5,\ x \neq -5;$ vertical asymptotes: $x = -5$
   E) $f(x) = x - 5,\ x \neq 5;$ vertical asymptotes: $x = 5$

7. Find the quadratic function f whose graph intersects the x-axis at $(2,0)$ and $(3,0)$ and the y-axis at $(0,-18)$.

A) $f(x)=3x^2+3x+9$

B) $f(x)=-3x^2+15x-18$

C) $f(x)=-3x^2-3x+6$

D) $f(x)=3x^2-3x-18$

E) $f(x)=3x^2-15x-18$

8. Using the factors $(-5x+2)$ and $(x-1)$, find the remaining factor(s) of $f(x)=10x^4+31x^3-84x^2+53x-10$ and write the polynomial in fully factored form.

A) $f(x)=(-5x+2)(-5x+2)(2x-1)(x-1)$

B) $f(x)=(-5x+2)(-x-5)(2x-1)(x-1)$

C) $f(x)=(-5x+2)^2(2x-1)(x+1)$

D) $f(x)=(-5x+2)(-x+5)^2(x+1)$

E) $f(x)=(-5x+2)^2(x-1)^2$

9. Simplify $\dfrac{4+3i}{5+2i}$ and write the answer in standard form.

A) $-\dfrac{26}{29}+\dfrac{7}{29}i$

B) $\dfrac{26}{29}-\dfrac{7}{29}i$

C) $\dfrac{26}{29}+\dfrac{7}{29}i$

D) $\dfrac{7}{29}+\dfrac{26}{29}i$

E) $\dfrac{7}{29}-\dfrac{26}{29}i$

10. Write the complex conjugate of the complex number $-5-\sqrt{10}\,i$.

A) $5-\sqrt{10}\,i$

B) $-5-\sqrt{-10}\,i$

C) $5-\sqrt{-10}\,i$

D) $-5+\sqrt{10}\,i$

E) $5+\sqrt{10}\,i$

11. Determine the value that $f(x)=\dfrac{4x-6}{x^2-7}$ approaches as x increases and decreases in magnitude without bound.

A) 8

B) 6

C) 4

D) 2

E) 0

12. Find all real zeros of the polynomial $f(x)=x^4+13x^3+40x^2$ and determine the mutiplicity of each.

A) $x=0$, multiplicity 2; $x=-8$, multiplicity 1; $x=-5$, multiplicity 1

B) $x=8$, multiplicity 2; $x=5$, multiplicity 2

C) $x=0$, multiplicity 2; $x=8$, multiplicity 1; $x=5$, multiplicity 1

D) $x=-8$, multiplicity 2; $x=-5$, multiplicity 2

E) $x=0$, multiplicity 1; $x=8$, multiplicity 1; $x=-8$, multiplicity 1; $x=5$, multiplicity 1

13. Given $3+i$ is a root, determine all other roots of $f(x)=x^4-10x^3+42x^2-88x+80$.

A) $x=3+i,\ 2\pm 2i,\ 2-i$

B) $x=3-i,\ 2\pm i$

C) $x=3-i,\ 2-2i,\ 2+i$

D) $x=3-i,\ -2\pm 2i$

E) $x=3-i,\ 2\pm 2i$

14. Determine the zeros (if any) of the rational function $f(x)=\dfrac{x^2-9}{x-2}$.

A) $x=2$
B) $x=\dfrac{3}{2}, x=-\dfrac{3}{2}$
C) $x=-9, x=9$
D) $x=-3, x=3$
E) no zeros

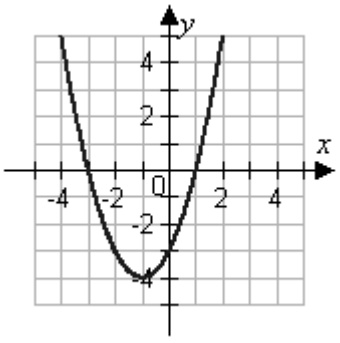
15. Determine the zeros (if any) of the rational function $g(x)=\dfrac{x^3-1}{x^2+5}$.

A) $x=-1, x=1$
B) $x=1$
C) $x=-\sqrt{5}, x=\sqrt{5}, x=1$
D) $x=-\sqrt{5}, x=\sqrt{5}, x=-1, x=1$
E) no zeros

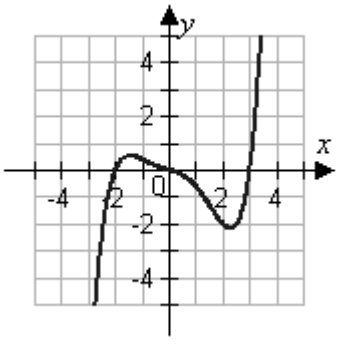
16. Match the equation with its graph.

$f(x)=\dfrac{x^4-17x^2+16}{20}$

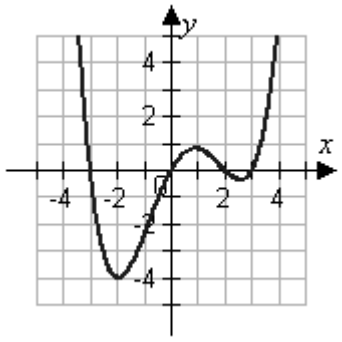
A)



B)



C)



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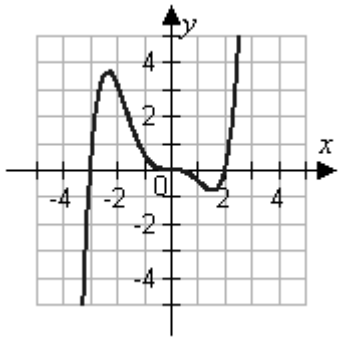
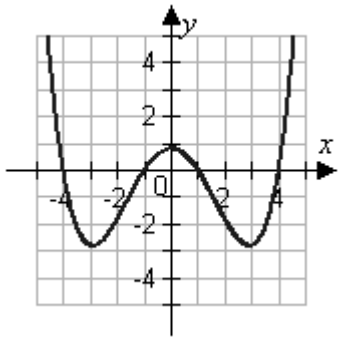


E)



17. Determine the zeros (if any) of the rational function $g(x) = 7 + \dfrac{3}{x^2 + 7}$.

A) $x = -\sqrt{7}, x = \sqrt{7}$

B) $x = -3$

C) $x = -\dfrac{3}{7}, x = \dfrac{3}{7}$

D) $x = -7, x = 7$

E) no zeros

18. Find all zeros of the function $f(x) = (x+6)(x+3i)(x-3i)$.

A) $x = 6, -3i, 3i$
B) $x = -6, 3i$
C) $x = -6, -3, 3$
D) $x = -6, -3i, 3i$
E) $x = -6$

19. Find the zeros of the function below algebraically, if any exist.

$$f(x) = 2x^4 + 10x^2 + 12$$

A) $-\sqrt{3}, -\sqrt{2}, \sqrt{2}$, and $\sqrt{3}$
B) $-\sqrt{3}$, 0, and $\sqrt{3}$
C) $-\sqrt{3}$ and $\sqrt{3}$
D) $-\sqrt{2}$ and $\sqrt{2}$
E) No zeros exist.

20. Simplify $\dfrac{2+5i}{3i}$ and write the answer in standard form.

A) $-\dfrac{5}{3} - \dfrac{2i}{3}$
B) $\dfrac{5}{3} - \dfrac{2i}{3}$
C) $\dfrac{5}{3} + \dfrac{2i}{3}$
D) $\dfrac{2}{3} + \dfrac{5i}{3}$
E) $-\dfrac{2}{3} + \dfrac{5i}{3}$

Answer Key

1. B
2. E
3. B
4. B
5. B
6. B
7. B
8. B
9. C
10. D
11. E
12. A
13. E
14. D
15. B
16. E
17. E
18. D
19. E
20. B

Name: _____ Date: _____

1. Find two positive real numbers whose product is a maximum and whose sum is 146.
   A) 71, 75
   B) 73, 73
   C) 78, 68
   D) 82, 64
   E) 61, 85

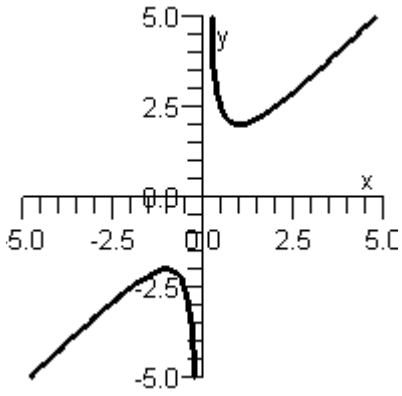
2. Write the complex conjugate of the following complex number and then multiply the number by the complex conjugate. Write the result in standard form.
   $1+\sqrt{-20}$
   A) $1-20i$; 19
   B) $1-5\sqrt{2}\,i$; 21
   C) $-1-2\sqrt{5}\,i$; 21
   D) $-1-2\sqrt{5}\,i$; 19
   E) $1-2\sqrt{5}\,i$; 21

3. Use synthetic division to divide.
   $\left(2x^3-5x^2-22x-15\right)\div\left(x-5\right)$
   A) $2x^2-3x-5$
   B) $2x^2+5x+3$
   C) $2x^2-2x-15$
   D) $2x^2-7x+6$
   E) $2x^2+5x+2$

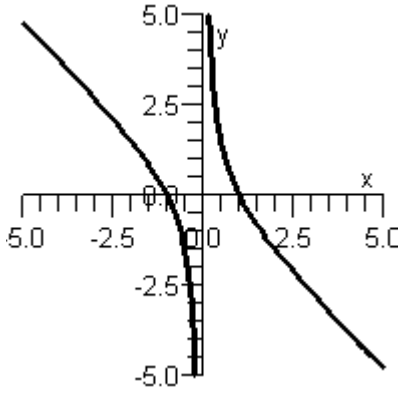
4. Sketch the graph of the rational function below.

$$f(x)=\frac{x^2-1}{x}$$

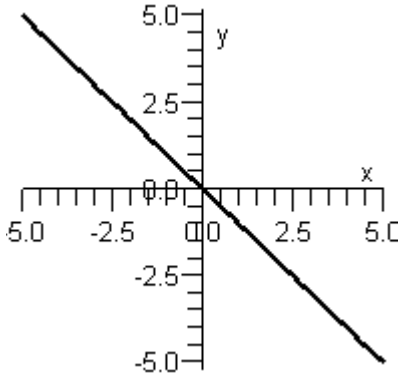
A)



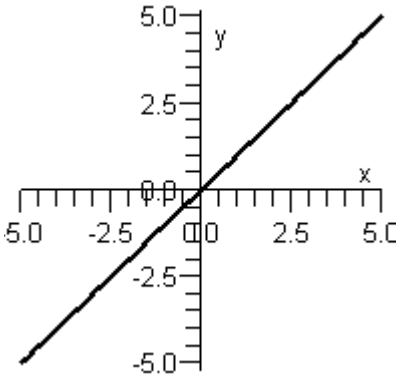
B)



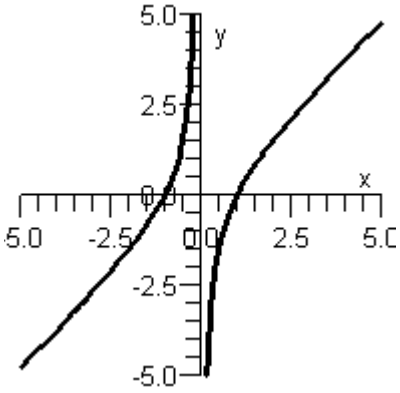
C)



D)



E)



5. Use long division to divide.

$$\left(2x^2+11x+12\right)\div\left(x+4\right)$$

A) $2x+19+\dfrac{88}{x+4}$

B) $2x+3$

C) $2x+19+\dfrac{22}{x+4}$

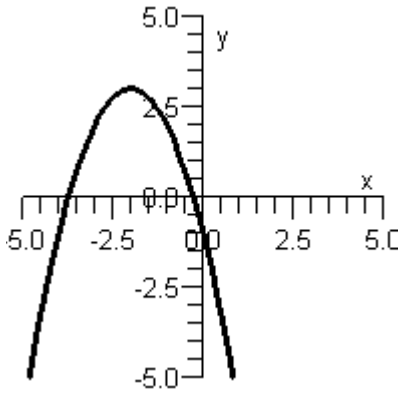
D) $2x+22$

E) $-2x-3$

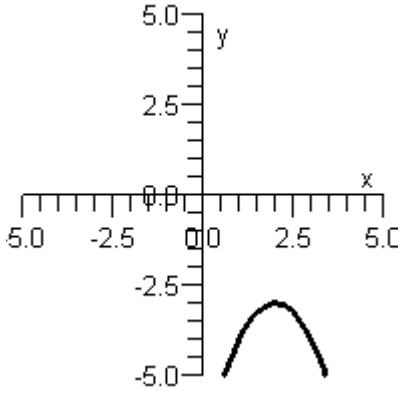
6. Sketch the graph of the quadratic function below.

$$h(x) = -x^2 - 4x - 1$$

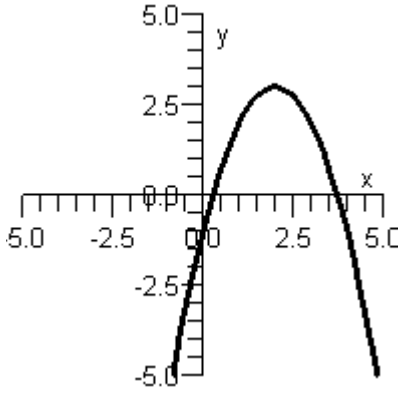
A)



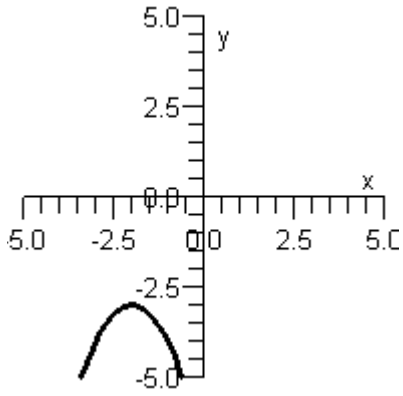
B)



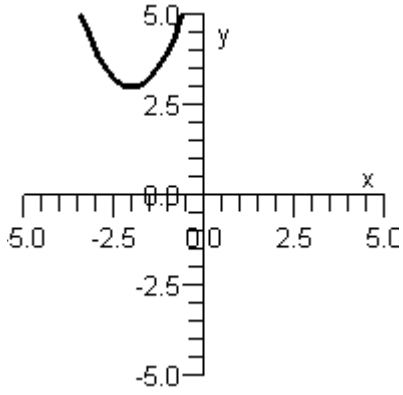
C)



D)



E)



7. If $x = 4$ is a root of $x^3 + 5x^2 - 16x - 80 = 0$, use synthetic division to factor the polynomial completely and list all real solutions of the equation.

A) $(x-5)(x-4)(x+4)$; $x = 5, 4, -4$

B) $(x+5)(x-4)(x+4)$; $x = -5, 4, -4$

C) $(x+5)(x-4)^2$; $x = -5, 4$

D) $(x+5)^2(x-4)$; $x = -5, 4$

E) $(x+5)(x-5)(x+4)$; $x = -5, 5, -4$

8. Simplify $\frac{-1-5i}{7i}$ and write the answer in standard form.

A) $\frac{5}{7}+\frac{i}{7}$

B) $-\frac{5}{7}+\frac{i}{7}$

C) $-\frac{5}{7}-\frac{i}{7}$

D) $-\frac{1}{7}-\frac{5i}{7}$

E) $\frac{1}{7}-\frac{5i}{7}$

9. Find all the rational zeros of the function $f(x)=3x^4-16x^3-59x^2+400x-400$.

A) $x=-4,5,-5,-\frac{3}{4}$

B) $x=3,-20,5$

C) $x=4,5,-5,\frac{4}{3}$

D) $x=-\frac{4}{5},\frac{5}{3},\frac{4}{3},-5$

E) $x=3,-20,\frac{5}{3},\frac{4}{3}$

10. Use long division to divide.

$$\left(x^3+27\right)\div\left(x+3\right)$$

A) x^2-3x+9

B) x^2-9

C) x^2+3x-9

D) x^2+9

E) $x^2-9+\frac{3}{x+3}$

11. Find all real zeros of the polynomial $f(x) = x^3 + 3x^2 - 49x - 147$ and determine the mutiplicity of each.
    A) $x = 7$, multiplicity 2; $x = -3$, multiplicity 1
    B) $x = 7$, multiplicity 1; $x = -7$, multiplicity 1; $x = -3$, multiplicity 1
    C) $x = -3$, multiplicity 2; $x = -7$, multiplicity 1
    D) $x = -7$, multiplicity 1; $x = 3$, multiplicity 1; $x = -3$, multiplicity 1
    E) $x = -3$, multiplicity 3

12. Use long division to divide.
    $$\left(x^3 + 4x - 1\right) \div \left(x + 2\right)$$
    A) $x^2 - 2x + 8 - \dfrac{17}{x+2}$
    B) $x^2 + 2x + 8 - \dfrac{15}{x+2}$
    C) $x^2 + 2 - \dfrac{3}{x+2}$
    D) $x^2 - 2 + \dfrac{3}{x+2}$
    E) $x^2 + 2x - 8 + \dfrac{17}{x+2}$

13. Find real numbers a and b such that the equation $a + bi = 10 - 12i$ is true.
    A) $a = -10,\ b = 12$
    B) $a = 10,\ b = 12$
    C) $a = -10,\ b = -12$
    D) $a = 10,\ b = -12$
    E) $a = 22,\ b = -2$

14. Determine the x-intercept(s) of the quadratic function $f(x) = x^2 - 10x + 26$.
    A) $(0,0), (4,0)$
    B) $(5,0), (10,0)$
    C) $(7,0), (2,0)$
    D) $(0,0), (2,0)$
    E) no x-intercept(s)

15. Determine the domain of $f(x) = \dfrac{3x+3}{x^2-3x}$.

A) all real numbers except $x = -1$, $x = 0$, and $x = 3$
B) all real numbers except $x = 0$ and $x = 3$
C) all real numbers except $x = -3$ and $x = -1$
D) all real numbers except $x = 3$
E) all real numbers

16. Perform the following operation and write the result in standard form.

$$\frac{9i}{9+i} + \frac{2}{9-i}$$

A) $\dfrac{9}{40} + \dfrac{83}{80}i$
B) $\dfrac{27}{10} + \dfrac{83}{10}i$
C) $\dfrac{1}{41} + \dfrac{9}{82}i$
D) $\dfrac{27}{82} + \dfrac{83}{82}i$
E) $\dfrac{27}{8} + \dfrac{83}{8}i$

17. The interest rates that banks charge to borrow money fluctuate with the economy. The interest rate charged by a bank in a certain country is given in the table below. Let t represent the year, with $t = 0$ corresponding to 1986. Use the *regression* feature of a graphing utility to find a quadratic model of the form $y = at^2 + bt + c$ for the data.

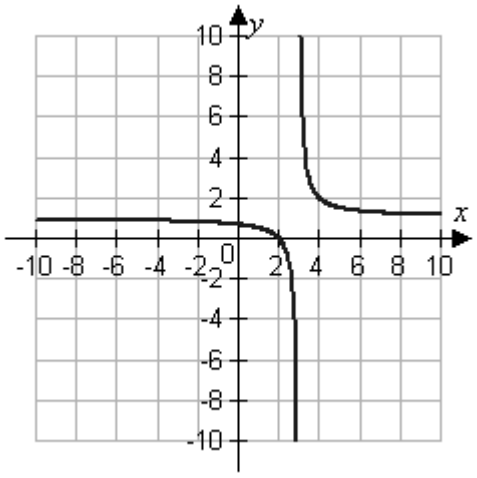
Year t	**Percent** y
1986	12.1
1988	10.1
1990	6.8
1992	6.6
1994	8.6
1996	12.0

A) $y = -2.23t^2 + 12.61t + 0.22$
B) $y = 12.61t^2 + 0.22t - 2.23$
C) $y = 0.22t^2 - 2.23t + 12.61$
D) $y = 0.17t^2 - 2.69t + 10.59$
E) $y = 0.26t^2 - 1.8t + 14.37$

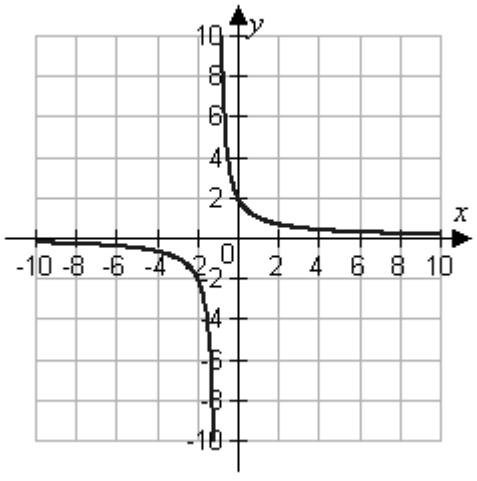
18. Which of the following is the graph of the given equation?

$$f(x) = \frac{2 - x}{x + 3}$$

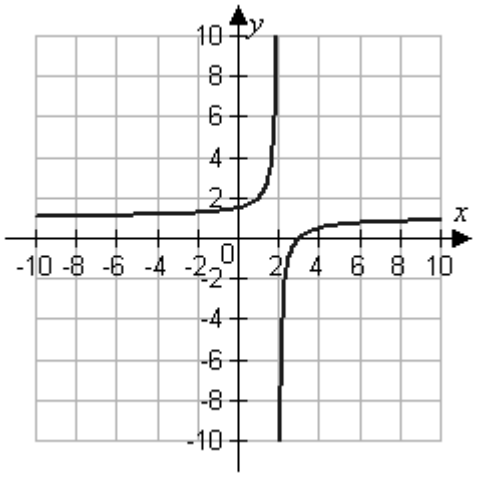
A)



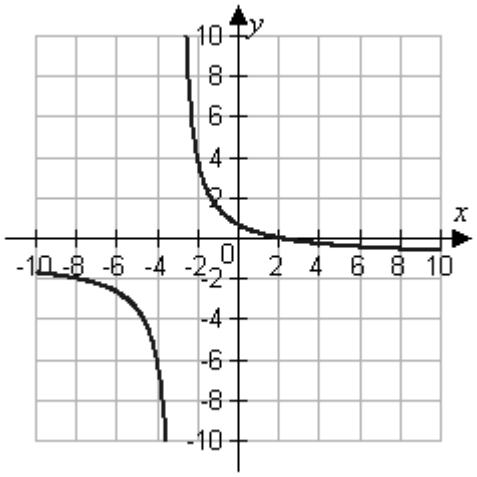
B)



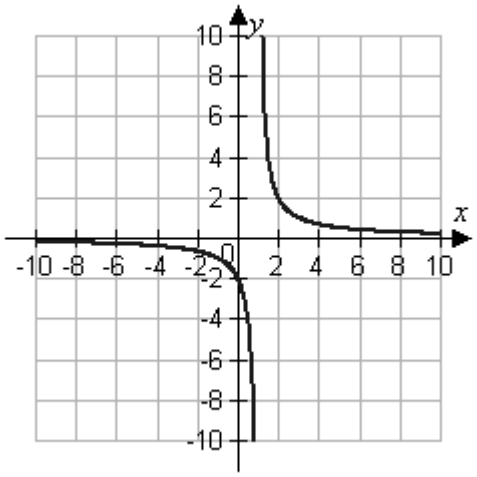
C)



D)



E)



19. Simplify $\left(\sqrt{-2}\right)^{11}$ and write the answer in standard form.

A) $32\sqrt{2}\,i$

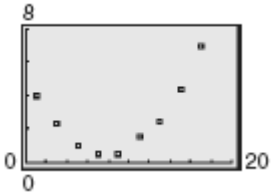
B) $-32\sqrt{2}\,i$

C) $1024\sqrt{2}\,i$

D) $-32\sqrt{2}$

E) The expression cannot be simplified.

20. Determine whether the scatter plot could best be modeled by a linear model, a quadratic model, or neither.



A) linear model

B) quadratic model

C) neither

Answer Key

1. B
2. E
3. B
4. E
5. B
6. A
7. B
8. B
9. C
10. A
11. B
12. A
13. D
14. E
15. B
16. D
17. C
18. D
19. B
20. B

Name: _____ Date: _____

1. Use the *regression* feature of a graphing utility to find a quadratic model for the data below.

x	y
–2	9.8
–1	4.1
0	3.3
1	6.6
2	13.8
3	24.1
4	39.5

A) $y = 1.91x^2 + 1.06x + 3.15$

B) $y = 1.81x^2 + 1.02x + 3.3$

C) $y = 2.21x^2 + 0.92x + 3.3$

D) $y = 2.11x^2 + 0.87x + 3.65$

E) $y = 2.01x^2 + 0.97x + 3.44$

2. Find a fifth degree polynomial function of the lowest degree that has the zeros below and whose leading coefficient is one.

$$-4,\ -1,\ 0,\ 1,\ 4$$

A) $f(x) = x^5 + 4x^4 - 13x^3 + 27x^2 + 36x$

B) $f(x) = x^5 + 4x^4 - 13x^3 - 27x^2 + 36x$

C) $f(x) = x^5 + 5x^4 - 19x^3 - 16x^2 + 48x$

D) $f(x) = x^5 + 7x^4 - 13x^3 - x^2 + 12x$

E) $f(x) = x^5 - 17x^3 + 16x$

3. The interest rates that banks charge to borrow money fluctuate with the economy. The interest rate charged by a bank in a certain country is given in the table below. Let t represent the year, with $t = 0$ corresponding to 1986. Use the *regression* feature of a graphing utility to find a quadratic model of the form $y = at^2 + bt + c$ for the data.

Year t	Percent y
1986	12.8
1988	10.0
1990	6.9
1992	5.7
1994	8.6
1996	12.7

A) $y = -2.7t^2 + 13.35t + 0.26$

B) $y = 13.35t^2 + 0.26t - 2.7$

C) $y = 0.26t^2 - 2.7t + 13.35$

D) $y = 0.21t^2 - 3.26t + 11.22$

E) $y = 0.32t^2 - 2.18t + 15.22$

4. Find all real zeros of the polynomial $f(x) = x^4 + 8x^3 + 12x^2$ and determine the mutiplicity of each.

A) $x = 0$, multiplicity 2; $x = -2$, multiplicity 1; $x = -6$, multiplicity 1

B) $x = 2$, multiplicity 2; $x = 6$, multiplicity 2

C) $x = 0$, multiplicity 2; $x = 2$, multiplicity 1; $x = 6$, multiplicity 1

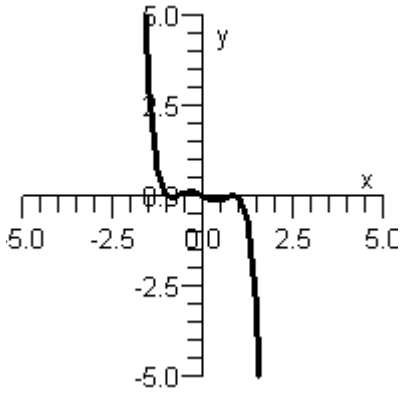
D) $x = -2$, multiplicity 2; $x = -6$, multiplicity 2

E) $x = 0$, multiplicity 1; $x = 2$, multiplicity 1; $x = -2$, multiplicity 1; $x = 6$, multiplicity 1

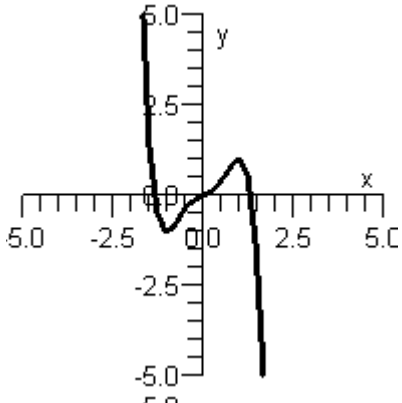
5. Which of the given graphs is the graph of the polynomial function below?

$$h(x) = x^5 + \frac{3}{2}x^3 - \frac{1}{2}x$$

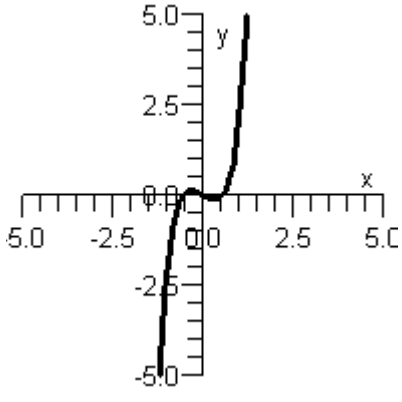
Graph 1 :



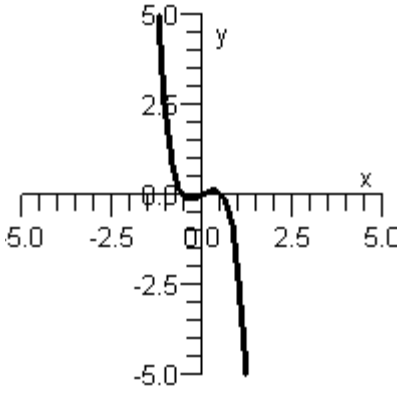
Graph 2 :



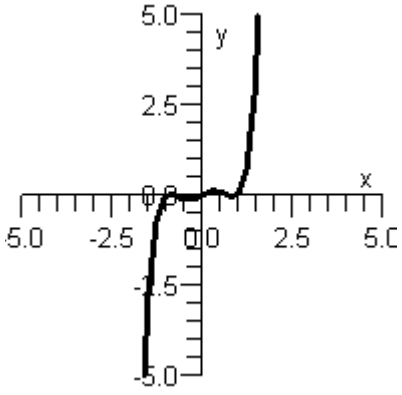
Graph 3 :



Graph 4 :



Graph 5 :



A) Graph 1
B) Graph 4
C) Graph 3
D) Graph 5
E) Graph 2

6. Determine the x-intercept(s) of the quadratic function $f(x) = x^2 - 12x + 37$.

A) $(1,0),(9,0)$
B) $(6,0),(15,0)$
C) $(8,0),(3,0)$
D) $(1,0),(3,0)$
E) no x-intercept(s)

7. Find a polynomial function with following characteristics.

Degree: 4
Zero: 4, multiplicity: 2
Zero: –3, multiplicity: 2
Falls to the left,
Falls to the right
Absolute value of the leading coefficient is one

A) $y = x^4 + x^3 - 23x^2 + 24x - 12$
B) $y = -x^4 + x^3 - 48x^2 + 9$
C) $y = x^4 - 6x^3 - 18x^2 + 25x + 48$
D) $y = -x^4 + 2x^3 + 23x^2 - 24x - 144$
E) $y = -x^4 + 2x^3 - 24x - 36$

8. Use synthetic division to divide.

$$\left(x^3 - 75x + 250\right) \div \left(x - 5\right)$$

A) $x^2 + 5x - 50$
B) $x^2 - 5x - 75$
C) $x^2 + 10x + 25$
D) $x^2 + 15x + 50$
E) $x^2 + 25x - 10$

9. Find the zeros of the function below algebraically, if any exist.

$$f(x) = x^4 + 8x^2 + 15$$

A) $-\sqrt{5},\ -\sqrt{3},\ \sqrt{3},$ and $\sqrt{5}$
B) $-\sqrt{3},\ 0,$ and $\sqrt{3}$
C) $-\sqrt{3}$ and $\sqrt{3}$
D) $-\sqrt{5}$ and $\sqrt{5}$
E) No zeros exist.

10. A polynomial function f has degree 3, the zeros below, and a solution point of $f(1) = -96$. Write f in completely factored form.

$$-2,\ -3+4i$$

A) $f(x) = (x+3)(x+2-4i)(x+2+4i)$

B) $f(x) = -(x+2)(x-4-3i)(x-4+3i)$

C) $f(x) = (x+2)(x-4-3i)(x-4+3i)$

D) $f(x) = -(x+2)(x+3-4i)(x+3+4i)$

E) $f(x) = (x+2)(x+3-4i)(x+3+4i)$

11. Describe the right-hand and the left-hand behavior of the graph of $q(x) = 7x^5 + x^3 + 7$.

A) Because the degree is odd and the leading coefficient is positive, the graph falls to the left and falls to the right.

B) Because the degree is odd and the leading coefficient is positive, the graph rises to the left and falls to the right.

C) Because the degree is odd and the leading coefficient is positive, the graph falls to the left and rises to the right.

D) Because the degree is odd and the leading coefficient is positive, the graph rises to the left and rises to the right.

E) Because the degree is even and the leading coefficient is positive, the graph rises to the left and rises to the right.

12. Find the zeros of the function below algebraically, if any exist.

$$f(x) = x^5 - 9x^3 + 27x^2 - 243$$

A) –2 and 2

B) –4 and 2

C) –4 and 4

D) –3 and 4

E) –3 and 3

13. Determine the vertex of the graph of the quadratic function $f(x) = x^2 - x + \frac{5}{4}$.

A) $\left(\frac{1}{2}, \frac{3}{2}\right)$

B) $\left(-1, \frac{5}{4}\right)$

C) $\left(-\frac{1}{2}, \frac{5}{4}\right)$

D) $\left(-\frac{1}{4}, -\frac{3}{4}\right)$

E) $\left(\frac{1}{2}, 1\right)$

14. Write the standard form of the equation of the parabola that has a vertex at $(3,8)$ and passes through the point $(5,-2)$.

A) $f(x) = -\frac{1}{2}(x-3)^2 + 5$

B) $f(x) = -\frac{5}{2}(x-3)^2 + 8$

C) $f(x) = -\frac{10}{9}(x+3)^2 + 8$

D) $f(x) = \frac{8}{5}(x-8)^2 - 2$

E) $f(x) = \frac{8}{9}(x-8)^2 - 5$

15. Find two positive real numbers whose product is a maximum and whose sum is 116.

A) 56, 60

B) 58, 58

C) 63, 53

D) 67, 49

E) 46, 70

16. Determine the zeros (if any) of the rational function $g(x) = 7 + \frac{2}{x^2 + 7}$.

A) $x = -\sqrt{7}, x = \sqrt{7}$
B) $x = -2$
C) $x = -\frac{2}{7}, x = \frac{2}{7}$
D) $x = -7, x = 7$
E) no zeros

17. Determine the domain of the function $f(x) = \frac{x^2 + 7x + 12}{x^2 + 16}$.

A) Domain: all real numbers except $x = -4$ and 3
B) Domain: all real numbers except $x = -16$
C) Domain: all real numbers except $x = -4$ and -3
D) Domain: all real numbers except $x = 4$ and 3
E) Domain: all real numbers

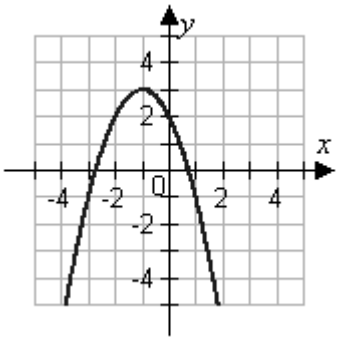
18. Write the complex conjugate of the complex number $3 - \sqrt{2}\,i$.

A) $-3 - \sqrt{2}\,i$
B) $3 - \sqrt{-2}\,i$
C) $-3 - \sqrt{-2}\,i$
D) $3 + \sqrt{2}\,i$
E) $-3 + \sqrt{2}\,i$

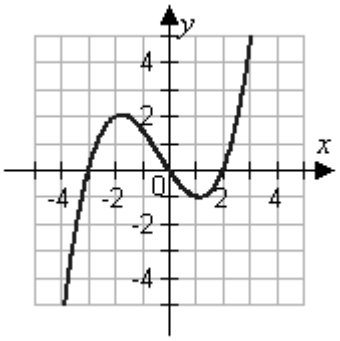
19. Match the equation with its graph.

$f(x) = x^2 + 2x - 3$

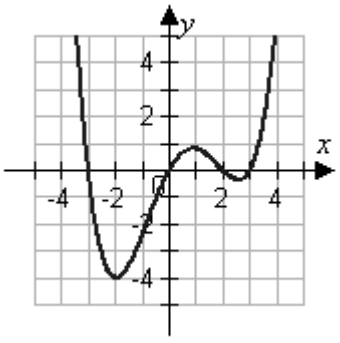
A)



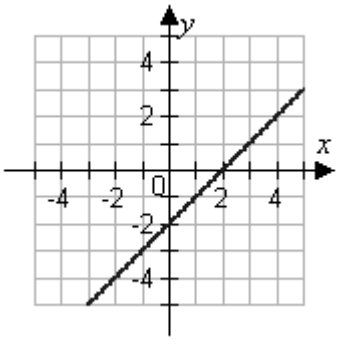
B)

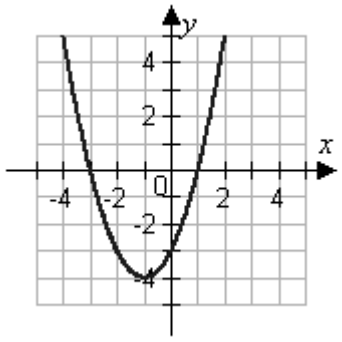


C)



D)



E) 

20. Write $f(x)=x^3-11x^2+18x+25$ in the form $f(x)=(x-k)q(x)+r$ when $k=6+\sqrt{6}$.

A) $f(x)=\left[x+\left(6+\sqrt{6}\right)\right]\left[x^2+\left(-5+\sqrt{6}\right)x-\left(6-\sqrt{6}\right)\right]-5$

B) $f(x)=\left[x+\left(6+\sqrt{6}\right)\right]\left[x^2+\left(-5+\sqrt{6}\right)x-\left(6-\sqrt{6}\right)\right]+5$

C) $f(x)=\left[x-\left(6+\sqrt{6}\right)\right]\left[x^2+\left(-5+\sqrt{6}\right)x-\left(6-\sqrt{6}\right)\right]+5$

D) $f(x)=\left[x-\left(6+\sqrt{6}\right)\right]\left[x^2+\left(-5+\sqrt{6}\right)x-\left(6-\sqrt{6}\right)\right]-5$

E) $f(x)=\left[x+\left(6+\sqrt{6}\right)\right]\left[x^2-\left(-5+\sqrt{6}\right)x-\left(6-\sqrt{6}\right)\right]-5$

Answer Key

1. E
2. E
3. C
4. A
5. C
6. E
7. D
8. A
9. E
10. D
11. C
12. E
13. E
14. B
15. B
16. E
17. E
18. D
19. E
20. D

Name: _____ Date: _____

1. Find all the rational zeros of the function $f(x) = 2x^4 - 9x^3 - 41x^2 + 225x - 225$.

   A) $x = -3, 5, -5, -\frac{2}{3}$

   B) $x = 2, -15, 5$

   C) $x = 3, 5, -5, \frac{3}{2}$

   D) $x = -\frac{3}{5}, \frac{5}{2}, \frac{3}{2}, -5$

   E) $x = 2, -15, \frac{5}{2}, \frac{3}{2}$

2. Using the factors $(x+4)$ and $(x+3)$, find the remaining factor(s) of $f(x) = x^3 + 6x^2 + 5x - 12$ and write the polynomial in fully factored form.

   A) $f(x) = (x+4)(x+3)(x-1)$

   B) $f(x) = (x+4)(x+3)^2$

   C) $f(x) = (x+4)(x+3)(x+1)$

   D) $f(x) = (x+4)^2(x+3)$

   E) $f(x) = (x+4)(x+3)(x+3)$

3. Find the quadratic function f whose graph intersects the x-axis at $(1,0)$ and $(4,0)$ and the y-axis at $(0,4)$.

   A) $f(x) = -x^2 - 3x - 4$

   B) $f(x) = x^2 - 5x + 4$

   C) $f(x) = x^2 + 3x + 4$

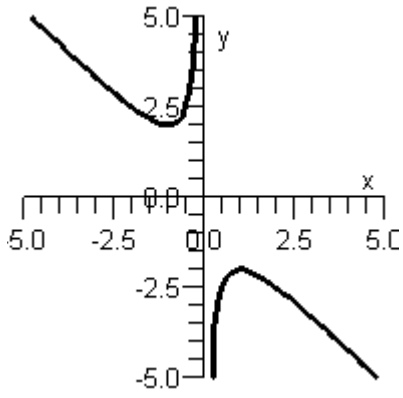
   D) $f(x) = -x^2 + 3x + 4$

   E) $f(x) = -x^2 + 5x + 4$

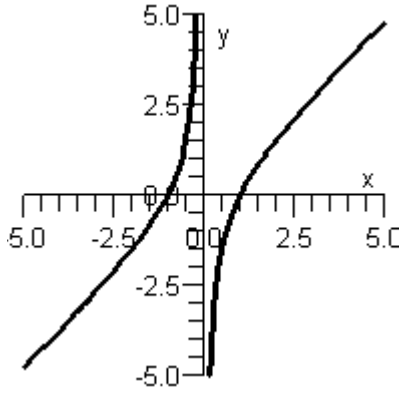
4. Sketch the graph of the rational function below.

$$f(x) = \frac{x^2 + 1}{x}$$

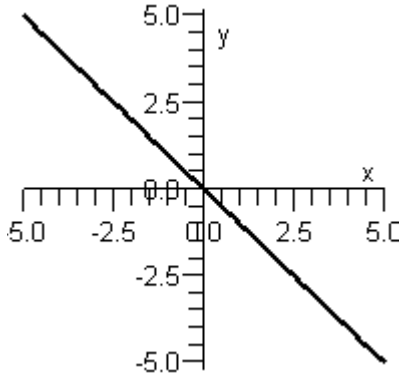
A)



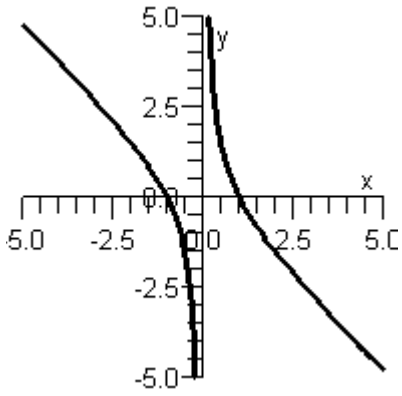
B)



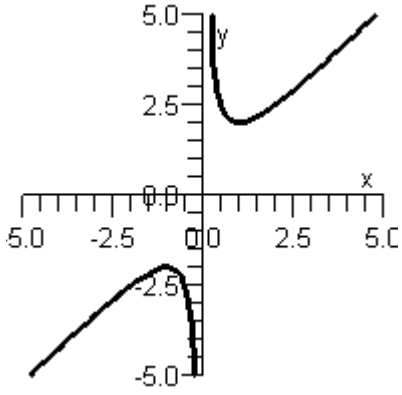
C)



D)



E)



5. Find all zeros of the function $f(x) = x^2(x-2)(x^3-216)$.

A) $x = 2, 216$
B) $x = 0, -2, -6$
C) $x = 0, 2, 6, -3-3\sqrt{3}i, -3+3\sqrt{3}i$
D) $x = -2, -216$
E) $x = 0, 2, 6$

6. Simplify $\left(\sqrt{-3}\right)^9$ and write the answer in standard form.

A) $-81\sqrt{3}\,i$
B) $81\sqrt{3}\,i$
C) $6561\sqrt{3}\,i$
D) $81\sqrt{3}$
E) The expression cannot be simplified.

7. Write the complex conjugate of the following complex number and then multiply the number by the complex conjugate. Write the result in standard form.

$2+\sqrt{-27}$

A) $2-27i$; 25

B) $2-3\sqrt{3}\,i$; 31

C) $-2-3\sqrt{3}\,i$; 31

D) $-2-3\sqrt{3}\,i$; 25

E) $2-3\sqrt{3}\,i$; 31

8. Determine the x-intercept(s) of the quadratic function $f(x)=x^2+6x+10$.

A) $(-8,0),(1,0)$

B) $(-3,0),(7,0)$

C) $(-1,0),(-6,0)$

D) $(-8,0),(-6,0)$

E) no x-intercept(s)

9. Compare the graph of $p(x)=\left[-\frac{1}{3}(x+9)\right]^2-9$ with $p(x)=x^2$.

A) $p(x)=\left[-\frac{1}{3}(x+9)\right]^2-9$ shifts right 9 units, shifts downward 9 units, and shrinks by a factor of $-\frac{1}{9}$.

B) $p(x)=\left[-\frac{1}{3}(x+9)\right]^2-9$ shifts right 81 units, shifts upward 9 units, and shrinks by a factor of $\frac{1}{9}$.

C) $p(x)=\left[-\frac{1}{3}(x+9)\right]^2-9$ shifts left 9 units, shifts downward 9 units, and shrinks by a factor of $\frac{1}{9}$.

D) $p(x)=\left[-\frac{1}{3}(x+9)\right]^2-9$ shifts right 9 units, shifts upward 9 units, and shrinks by a factor of $\frac{1}{9}$.

E) $p(x)=\left[-\frac{1}{3}(x+9)\right]^2-9$ shifts left 81 units, shifts upward 9 units, and shrinks by a factor of $-\frac{1}{3}$.

10. Find a polynomial function of the lowest degree with real coefficients that has the zeros below and whose leading coefficient is one.

$$0,\ 2,\ 4-i$$

A) $f(x)=x^4-34x^3+32x^2-10x$

B) $f(x)=x^4-10x^3+33x^2-34x$

C) $f(x)=x^4+32x^3-10x^2-34x$

D) $f(x)=x^4-10x^3-34x^2+32x$

E) $f(x)=x^4+32x^3-34x^2-10x$

11. If $x=-1$ is a root of $x^3+2x^2-x-2=0$, use synthetic division to factor the polynomial completely and list all real solutions of the equation.

A) $(x-2)(x+1)(x-1);\ x=2,-1,1$

B) $(x+2)(x+1)(x-1);\ x=-2,-1,1$

C) $(x+2)(x+1)^2;\ x=-2,-1$

D) $(x+2)^2(x+1);\ x=-2,-1$

E) $(x+2)(x-2)(x-1);\ x=-2,2,1$

12. Determine the vertex of the graph of the quadratic function $f(x)=x^2+5$.

A) $(0,-5)$

B) $(5,0)$

C) $(5,5)$

D) $(0,5)$

E) $(-5,0)$

13. Find all real zeros of the polynomial $f(x) = x^4 - 80x^2 + 1024$ and determine the mutiplicity of each.
    A) $x = 64$, multiplicity 2; $x = 16$, multiplicity 2
    B) $x = 8$, multiplicity 2; $x = 4$, multiplicity 2
    C) $x = 64$, multiplicity 2; $x = 4$, multiplicity 1
    D) $x = -8$, multiplicity 2; $x = -4$, multiplicity 2
    E) $x = 8$, multiplicity 1; $x = -8$, multiplicity 1; $x = 4$, multiplicity 1; $x = -4$, multiplicity 1

14. Determine the zeros (if any) of the rational function $g(x) = 5 + \dfrac{2}{x^2 + 5}$.
    A) $x = -\sqrt{5}, x = \sqrt{5}$
    B) $x = -2$
    C) $x = -\dfrac{2}{5}, x = \dfrac{2}{5}$
    D) $x = -5, x = 5$
    E) no zeros

15. Use the *regression* feature of a graphing utility to find a quadratic model for the data below.

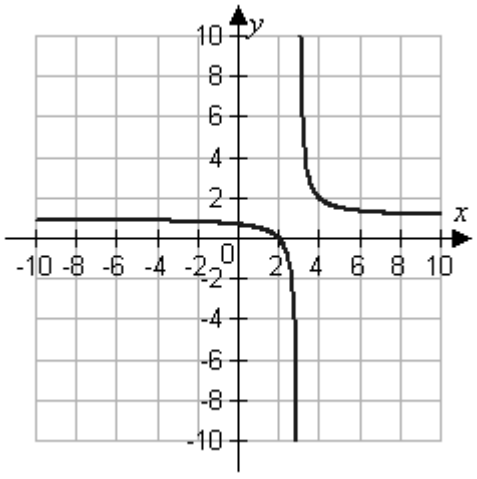
x	*y*
–2	–7.3
–1	–2
0	–1
1	–4.8
2	–11.4
3	–22.8
4	–37.8

    A) $y = -1.91x^2 - 1.21x - 1.57$
    B) $y = -1.81x^2 - 1.15x - 1.42$
    C) $y = -2.21x^2 - 1.04x - 1$
    D) $y = -2.11x^2 - 0.99x - 1.07$
    E) $y = -2.01x^2 - 1.1x - 1.28$

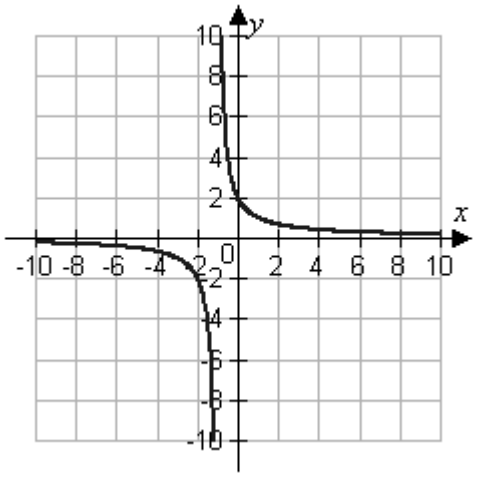
16. Which of the following is the graph of the given equation?

$$f(x) = \frac{2 - x}{x + 3}$$

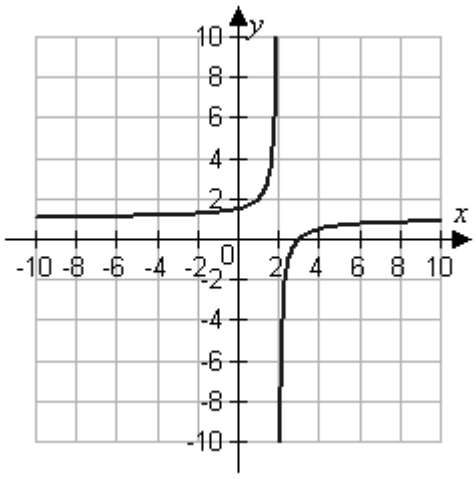
A)



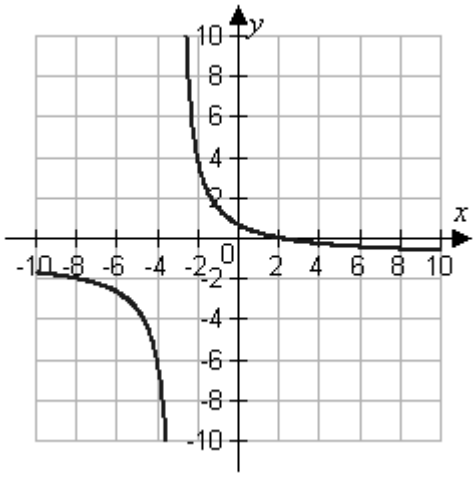
B)



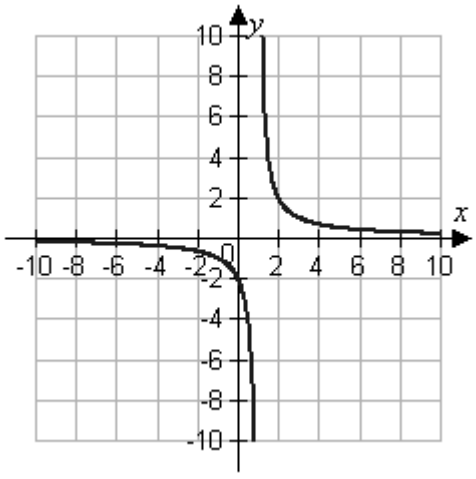
C)



D)



E)



17. Simplify $\frac{1-2i}{5i}$ and write the answer in standard form.

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

B) $-\frac{2}{5}-\frac{i}{5}$

C) $-\frac{2}{5}+\frac{i}{5}$

D) $\frac{1}{5}-\frac{2i}{5}$

E) $-\frac{1}{5}-\frac{2i}{5}$

18. Use long division to divide.

$$\left(6x^2-20x+6\right)\div\left(x-3\right)$$

A) $6x-38+\frac{120}{x-3}$

B) $6x-2$

C) $6x-38+\frac{40}{x-3}$

D) $6x-40$

E) $-6x+2$

19. Compare the graph of $s(x)=5\left(x-5\right)^2+9$ with $s(x)=x^2$.

A) $s(x)=5\left(x-5\right)^2+9$ shifts right 5 units, shifts downward 9 units, and shrinks by a factor of $\frac{1}{5}$.

B) $s(x)=5\left(x-5\right)^2+9$ shifts right 5 units, shifts upward 9 units, and stretches by a factor of 5.

C) $s(x)=5\left(x-5\right)^2+9$ shifts left 5 units, shifts downward 9 units, and stretches by a factor of 5.

D) $s(x)=5\left(x-5\right)^2+9$ shifts right 5 units, shifts upward 9 units, and shrinks by a factor of $\frac{1}{5}$.

E) $s(x)=5\left(x-5\right)^2+9$ shifts left 5 units, shifts upward 9 units, and stretches by a factor of 5.

20. Find the zeros of the function below algebraically, if any exist.

$$f(x) = x^6 + 28x^3 + 27$$

A) –3 and –1
B) –2 and –1
C) –3 and –2
D) –2, –1, 1, and 2
E) –3, –2, 2, and 3

Answer Key

1. C
2. A
3. B
4. E
5. C
6. B
7. E
8. E
9. C
10. B
11. B
12. D
13. E
14. E
15. E
16. D
17. B
18. B
19. B
20. A

Name: _____ Date: _____

1. Given $f(x)=\dfrac{5x+4}{5x^2+4x}$. Determine the domain of $f(x)$ and find any vertical asymptotes.

   A) **domain:** all real numbers except $x=-\dfrac{4}{5}$
   vertical asymptote: $x=0$

   B) **domain:** all real numbers except $x=0$ and $x=-\dfrac{4}{5}$
   vertical asymptote: $x=0$

   C) **domain:** all real numbers
   vertical asymptotes: $x=0$ and $x=-\dfrac{4}{5}$

   D) **domain:** all real numbers except $x=0$ and $x=\dfrac{4}{5}$
   vertical asymptote: $x=0$

   E) **domain:** all real numbers except $x=\dfrac{4}{5}$
   vertical asymptotes: $x=0$ and $x=-\dfrac{4}{5}$

2. Determine the value that $f(x)=\dfrac{3x-5}{x-6}$ approaches as x increases and decreases in magnitude without bound.
   A) 6
   B) 5
   C) 4
   D) 3
   E) 2

3. Determine the x-intercept(s) of the quadratic function $f(x)=x^2-15x+56$.
   A) $(8,0),(7,0)$
   B) $(-4,0),(-8,0)$
   C) $(-8,0),(-7,0)$
   D) $(4,0),(8,0)$
   E) no x-intercept(s)

4. Simplify $\dfrac{2+i}{5+2i}$ and write the answer in standard form.

A) $-\dfrac{12}{29}+\dfrac{1}{29}i$

B) $\dfrac{12}{29}-\dfrac{1}{29}i$

C) $\dfrac{12}{29}+\dfrac{1}{29}i$

D) $\dfrac{1}{29}+\dfrac{12}{29}i$

E) $\dfrac{1}{29}-\dfrac{12}{29}i$

5. Write the polynomial in completely factored form. (Hint: One factor is x^2+1.)

$$f(x)=x^4+6x^3+14x^2+6x+13$$

A) $f(x)=(x-2)(x+2)(x+3-i)(x+3+i)$

B) $f(x)=(x-3)(x+3)(x-1-2i)(x-1+2i)$

C) $f(x)=(x-1)(x+1)(x+3-2i)(x+3+2i)$

D) $f(x)=(x-3i)(x+3i)(x-1-2i)(x-1+2i)$

E) $f(x)=(x-i)(x+i)(x+3-2i)(x+3+2i)$

6. Use long division to divide.

$$\left(x^3+5x^2+36x+180\right)\div(x+5)$$

A) x^2+30

B) $x^2+10x+44-\dfrac{244}{x+5}$

C) $x^2+10x+86+\dfrac{110}{x+5}$

D) $x^2+10x+44$

E) x^2+36

7. Find the quadratic function f whose graph intersects the x-axis at $(-7,0)$ and $(1,0)$ and the y-axis at $(0,-14)$.

A) $f(x) = -2x^2 - 16x - 2$

B) $f(x) = 2x^2 + 12x - 14$

C) $f(x) = 2x^2 + 16x - 7$

D) $f(x) = -2x^2 + 16x - 14$

E) $f(x) = -2x^2 - 12x - 14$

8. Suppose the IQ scores (y, rounded to the nearest 10) for a group of people are summarized in the table below. Use the *regression* feature of a graphing utility to find a quadratic function of the form $y = ax^2 + bx + c$ for the data.

IQ Score y	**Number of People** x
70	53
80	72
90	93
100	90
110	78
120	47
130	16

A) $y = -0.04x^2 + 14.93x - 404.96$

B) $y = -0.06x^2 + 11.94x - 476.43$

C) $y = -0.08x^2 + 10.87x - 500.25$

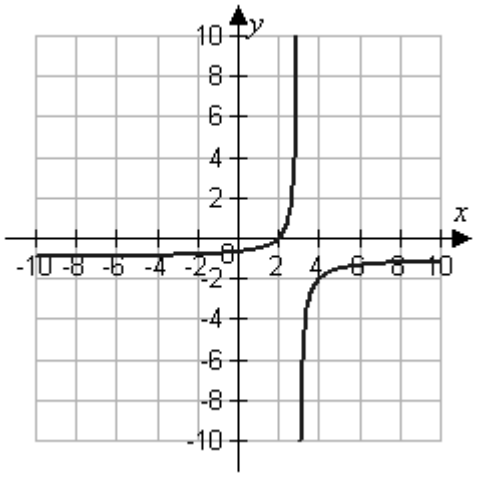
D) $y = -0.07x^2 + 13.5x - 452.61$

E) $y = -0.09x^2 + 8.48x - 547.89$

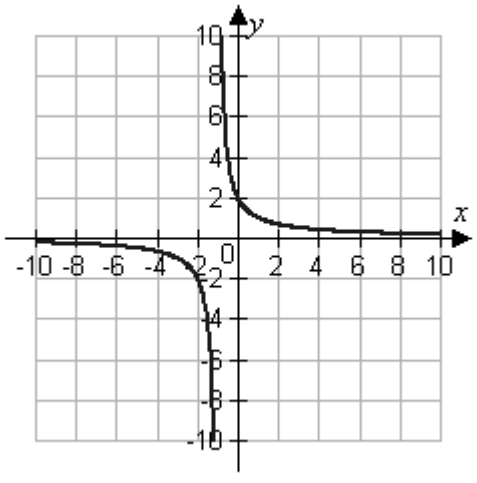
9. Which of the following is the graph of the given equation?

$$f(x) = \frac{x-2}{x-3}$$

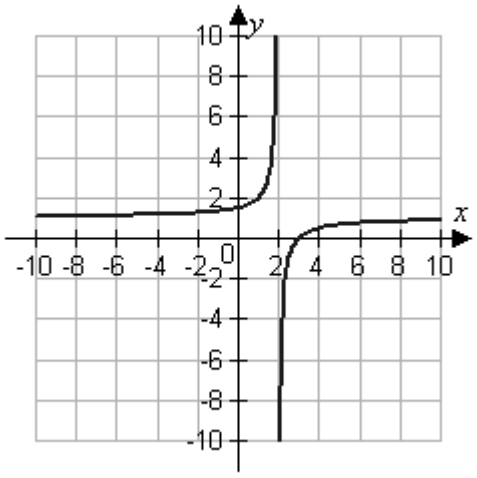
A)



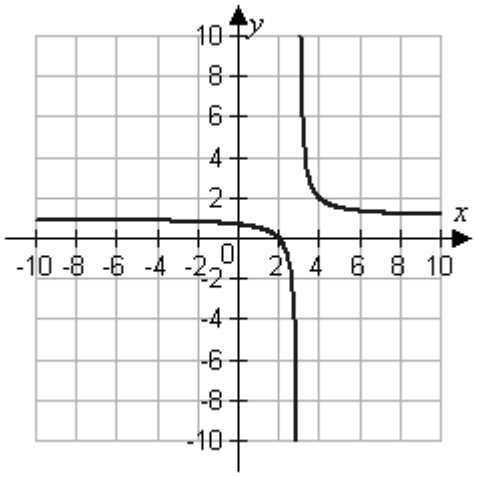
B)



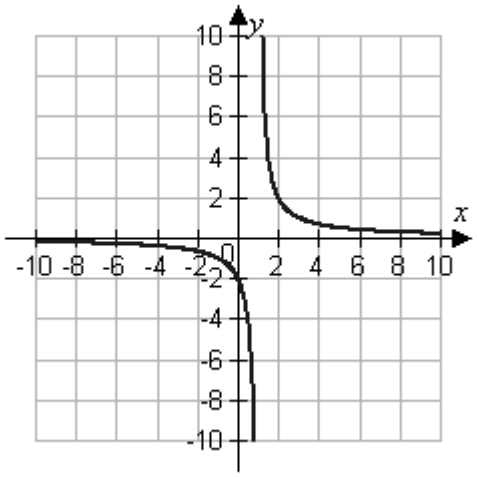
C)



D)



E)



10. Use the *regression* feature of a graphing utility to find a quadratic model for the data below.

x	y
–2	15.7
–1	3.5
0	–2.7
1	–2.9
2	3.7
3	15.8
4	33.6

A) $y = 2.89x^2 - 3.35x - 2.9$

B) $y = 2.73x^2 - 3.2x - 2.75$

C) $y = 3.34x^2 - 2.9x - 2.7$

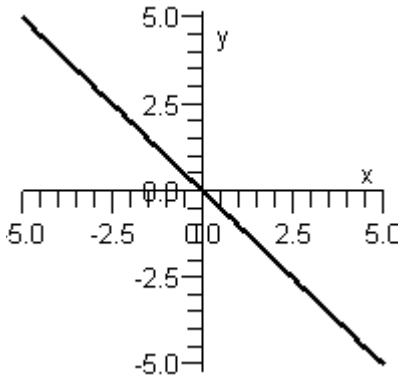
D) $y = 3.19x^2 - 2.74x - 2.4$

E) $y = 3.04x^2 - 3.05x - 2.61$

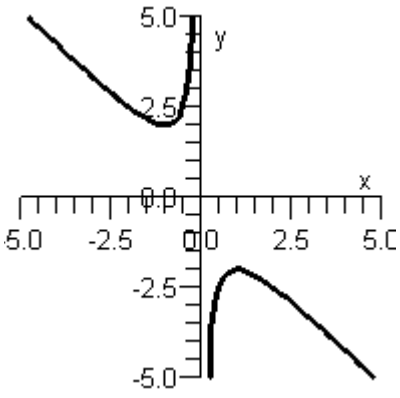
11. Sketch the graph of the rational function below.

$$f(x) = -\frac{x^2 - 1}{x}$$

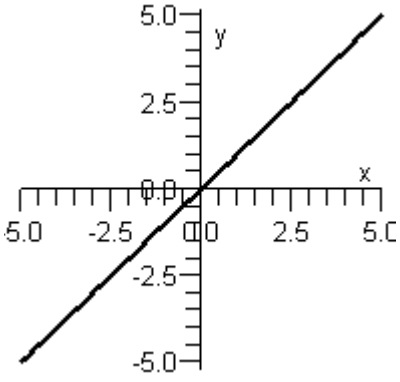
A)



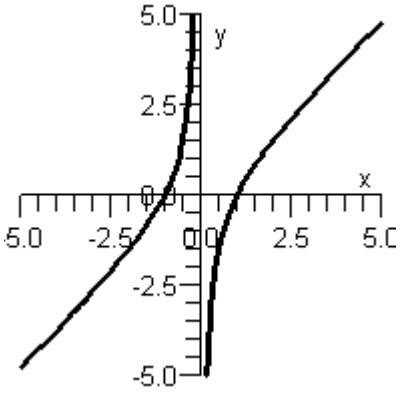
B)



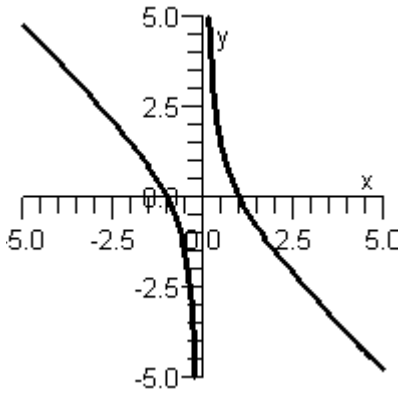
C)



D)



E)



12. If $f(x) = 4x^2 - 2x - 7$, use synthetic division to evaluate $f\left(\frac{7}{8}\right)$.

A) $f\left(\frac{7}{8}\right) = \frac{21}{2}$

B) $f\left(\frac{7}{8}\right) = -\frac{21}{2}$

C) $f\left(\frac{7}{8}\right) = -\frac{91}{16}$

D) $f\left(\frac{7}{8}\right) = -\frac{35}{2}$

E) $f\left(\frac{7}{8}\right) = -\frac{77}{8}$

13. Find a polynomial function of the lowest degree with real coefficients that has the zeros below and whose leading coefficient is one.

$$0,\ -3,\ 1+3i$$

A) $f(x) = x^4 + 30x^3 - 5x^2 + x$

B) $f(x) = x^4 + x^3 + 4x^2 + 30x$

C) $f(x) = x^4 - 5x^3 + x^2 + 30x$

D) $f(x) = x^4 + x^3 + 30x^2 - 5x$

E) $f(x) = x^4 - 5x^3 + 30x^2 + x$

14. Simplify $(-4+i)(4-5i)$ and write the answer in standard form.

A) $16+24i$
B) $-11-24i$
C) $-16+24i$
D) $-16-21i$
E) $-11+24i$

15. Write the standard form of the equation of the parabola that has a vertex at $\left(\frac{-2}{3},\frac{1}{9}\right)$ and passes through the point $(3,-4)$.

A) $f(x)=-\frac{37}{11}\left(x+\frac{2}{3}\right)^2+\frac{1}{9}$
B) $f(x)=-\frac{37}{121}\left(x-\frac{3}{2}\right)^2+\frac{1}{9}$
C) $f(x)=-\frac{37}{121}\left(x+\frac{2}{3}\right)^2+\frac{1}{9}$
D) $f(x)=-\frac{37}{11}\left(x-\frac{2}{3}\right)^2-\frac{1}{9}$
E) $f(x)=-\frac{37}{25}\left(x-\frac{3}{2}\right)^2-\frac{1}{9}$

16. Determine the vertex of the graph of the quadratic function $f(x)=x^2+5x+\frac{29}{4}$.

A) $\left(\frac{-5}{2},\frac{27}{2}\right)$
B) $\left(5,\frac{29}{4}\right)$
C) $\left(\frac{5}{2},\frac{29}{4}\right)$
D) $\left(\frac{5}{4},\frac{21}{4}\right)$
E) $\left(\frac{-5}{2},1\right)$

17. Use synthetic division to divide.

$$\left(6+5x^3+23x+22x^2\right)\div\left(x+3\right)$$

A) $5x^2+8x+3$
B) $5x^2+17x+10$
C) $5x^2+5x+6$
D) $5x^2+7x+2$
E) $5x^2+7x+5$

18. Find the zeros of the function below algebraically, if any exist.

$$f(t)=\frac{1}{6}t^4-\frac{27}{2}$$

A) –3, –1, 1, and 3
B) –3 and 3
C) –6 and 6
D) –6, –1, 1, and 6
E) No zeros exist.

19. Find real numbers a and b such that the equation $a+bi=4-9i$ is true.

A) $a=-4,\ b=9$
B) $a=4,\ b=9$
C) $a=-4,\ b=-9$
D) $a=4,\ b=-9$
E) $a=13,\ b=-5$

20. Determine the vertex of the graph of the quadratic function $f(x)=x^2+2$.

A) $(0,-2)$
B) $(2,0)$
C) $(2,2)$
D) $(0,2)$
E) $(-2,0)$

Answer Key

1. B
2. D
3. A
4. C
5. E
6. E
7. B
8. B
9. D
10. E
11. E
12. C
13. B
14. E
15. C
16. E
17. D
18. B
19. D
20. D