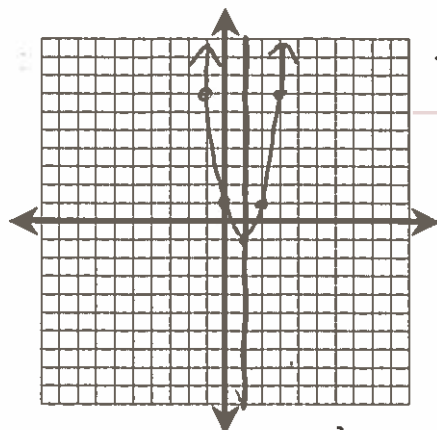


Chapter 5: Graph Quadratic Equations

Graph and identify the vertex, axis of symmetry, and y-intercept. Does each graph have a minimum or a maximum? FOR NUMBER 2: List the transformations from the parent function.

1. $f(x) = 2x^2 - 4x + 1$

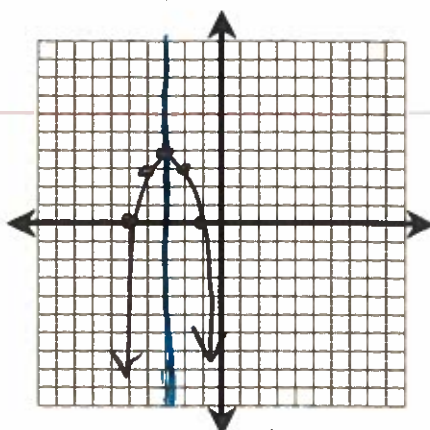


$$\frac{4}{2(2)} = \frac{4}{4} = 1$$

x	y
1	-1
0	1
-1	7

Vertex: (1, -1)
Axis of Symmetry: x = 1
y-intercept: 1
Vertex is a max or min? min

2. $y = -(x+3)^2 + 4$



x	y
-3	4
-2	3
-1	0

Vertex: (-3, 4)
Axis of Symmetry: x = -3
y-intercept: -5 $-(0+3)^2 + 4$
Vertex is a max or min? max
Transformations: left 3, up 4, reflection over x-axis

Chapter 5: Simplify Quadratic and Complex Expressions:

Factor the expression completely.

3. $2x^2 - 72$

$$2(x^2 - 36)$$

$$2(x+6)(x-6)$$

4. $3x^2 + 13x + 4$

$$(3x+1)(x+4)$$

5. $6x^2 - 48x + 42$

$$6(x^2 - 8x + 7)$$

$$6(x-7)(x-1)$$

6. $36x^2 + 3x - 5$

$$(3x-1)(12x+5)$$

7. $4x^2 - 22x + 30$

$$2(2x^2 - 11x + 15)$$

$$2(2x-5)(x-3)$$

8. $3x^2 - 75$

$$3(x^2 - 25)$$

$$3(x+5)(x-5)$$

Write the expression as a complex number in standard form (a + bi).

9. $(3+2i) + (7-i)$

$$10 + i$$

10. $(3+2i)(7-i)$

$$21 - 3i + 14i - 2i^2$$

$$21 + 11i + 2$$

11. $(5+2i)^2$

$$(5+2i)(5+2i)$$

$$25 + 10i + 10i + 4i^2$$

$$25 + 20i - 4$$

$$21 + 20i$$

12. $(6-3i) - (-4-7i)$

$$6 - 3i + 4 + 7i$$

$$10 + 4i$$

Chapter 5: Solve and Apply Quadratic Equations:

Solve. Find exact answers.

13. $x^2 - 5x = -2$

$$x^2 - 5x + 2 = 0$$

$$\frac{5 \pm \sqrt{(-5)^2 - 4(1)(2)}}{2(1)} = \frac{5 \pm \sqrt{17}}{2}$$

14. $2x^2 - 6x + 7 = 0$

$$\frac{6 \pm \sqrt{(-6)^2 - 4(2)(7)}}{2(2)}$$

$$\frac{6 \pm \sqrt{-20}}{4} = \frac{6 \pm 2i\sqrt{5}}{4} = \frac{3 \pm i\sqrt{5}}{2}$$

15. $(x+2)^2 + 10 = 1$

$$(x+2)^2 = -9$$

$$\sqrt{(x+2)^2} = \sqrt{-9}$$

$$x+2 = \pm 3i$$

$$x = -2 \pm 3i$$

16. $x^2 + 24 = 11x$

$$x^2 - 11x + 24 = 0$$

$$(x-8)(x-3) = 0$$

$$x = 8 \quad x = 3$$

17. $-3x^2 = 2x + 1$

$$3x^2 + 2x + 1 = 0$$

$$\frac{-2 \pm \sqrt{(2)^2 - 4(3)(1)}}{2(3)} = \frac{-2 \pm \sqrt{-8}}{6}$$

$$\frac{-2 \pm 2i\sqrt{2}}{6} = \frac{-1 \pm i\sqrt{2}}{3}$$

18. $47 = 8x^2 - 3$

$$8x^2 - 3 = 47$$

$$8x^2 = 50$$

$$x^2 = \frac{25}{4}$$

$$x = \pm \frac{5}{2}$$

19. A model for a company's revenue is $R = -15p^2 + 300p + 120,000$, where p is the price in dollars of the company's product. What price will maximize revenue? What is the maximum revenue?

max price : \$10
max revenue : \$121,500

x min : -10
 x max : 100
 y min : -10
 y max : 200,000

20. The equation $g = .23m^2$ gives the gross profit (in dollars) of minutes worked. How many minutes are worked if the gross profit is \$20,500? Round your answer to one decimal place.

$$\frac{20,500}{.23} = .23m^2$$

$$89130.43 = m^2$$

$$\sqrt{89130.43} = \sqrt{m^2}$$

$$298.5 = m$$

min

21. Abigail tosses a coin off a bridge into the stream below. The distance, in feet, the coin is above the water is modeled by the equation $y = -16x^2 + 34x + 112$, where x is time in seconds.

- How high is the bridge above the water? 112 ft
- What is the maximum height of the coin? 130.06 ft
- How many seconds does it take for the coin to reach the maximum height? 1.06 sec
- How long does it take the coin to reach 50 feet above water? between 3 and 4 sec
- How long does it take for the coin to splash the water? 3.9 sec

x min : -10 y min : -10
 x max : 10 y max : 200

Chapter 6: Characteristics of Polynomial Functions

22. Classify by degree and number of terms.

a) $3x+2$

linear
binomial

b) x^2+3x+5

quadratic
trinomial

c) $3x^3$

cubic
monomial

d) $-8x-13x^5+7x^2+24$

quintic
polynomial

23. Write an equation of the polynomial with the give zeros in factored form and standard form.

a) -2, 5, and 0

Factored Form: $y = x(x+2)(x-5)$

$$(x^2 + 2x)(x - 5)$$

$$x^3 - 5x^2 + 2x^2 - 10x$$

Standard Form: $y = x^3 - 3x^2 - 10x$

b) -3 and 4 (multiplicity of 2)

Factored Form: $y = (x+3)(x-4)^2$

$$(x+3)(x-4)$$

$$x^2 - 4x + 3x - 12$$

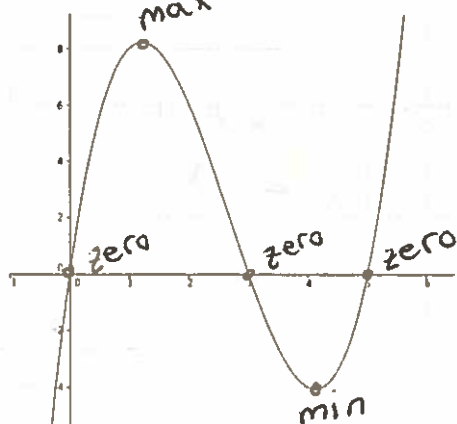
$$(x^2 - x - 12)(x-4)$$

$$x^3 - 4x^2 - x^2 - 12x + 4x + 48$$

Standard Form: $y = x^3 - 5x^2 - 8x + 48$

Determine the end behavior, find all relative maximums and minimums, identify the zeros and state any multiplicity.

24.



$$x \rightarrow -\infty, f(x) \rightarrow -\infty$$

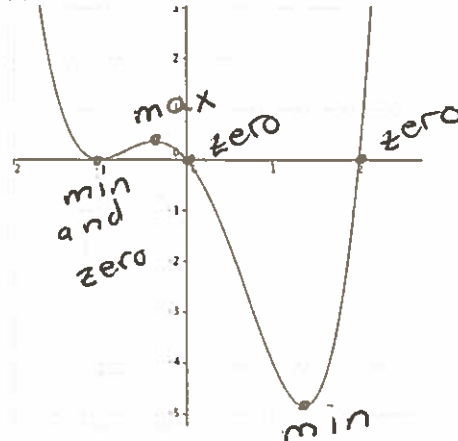
$$x \rightarrow \infty, f(x) \rightarrow \infty$$

Max(s): $(1, 8)$

Min(s): $(4, -4)$

Zeros: $0, 3, \text{ and } 5$

25.



$$x \rightarrow -\infty, f(x) \rightarrow \infty$$

$$x \rightarrow \infty, f(x) \rightarrow \infty$$

Max(s): $(-0.5, 0.5)$

Min(s): $(-1, 0)$ and $(1.2, -4.9)$

Zeros: -1 mult of 2, 0 , and 2

26. Divide the following. Is the binomial a factor of the polynomial?

a) $(x^3 + 3x^2 + 5) \div (x+1)$

$$\begin{array}{r|rrrrr} -1 & 1 & 3 & 0 & 5 & \\ & \downarrow & -1 & -2 & 2 & \\ \hline & 1 & 2 & -2 & 7 & \end{array}$$

$x^2 + 2x - 2$ R 7

b) $(5x^4 - 2x^3 - 32x) \div (x-2)$ $5x^3 + 8x^2 + 16x$

$$\begin{array}{r|rrrrr} 2 & 5 & -2 & 0 & -32 & 0 \\ & \downarrow & 10 & 16 & 32 & 0 \\ \hline & 5 & 8 & 16 & 0 & 0 \end{array}$$

27. If 3 , $3-i$, and $2+\sqrt{3}$ are roots of a polynomial equation, find all other roots.

$3+i$ and $2-\sqrt{3}$

Chapter 6: Solve Polynomial Equations

28. List the possible rational zeros of $f(x) = 3x^3 + 5x^2 - 15$.

factors 15 = $\frac{1, 3, 5, 15}{1, 3}$ = $\pm 1, \pm 3, \pm 5, \pm 15, \pm \frac{1}{3}, \pm \frac{5}{3}$

29. List the possible rational zeros of $f(x) = 2x^3 - x^2 - 18x + 21$.

factors 21 = $\frac{1, 3, 7, 21}{1, 2}$ = $\pm 1, \pm 3, \pm 7, \pm 21, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{7}{2}, \pm \frac{21}{2}$

Determine the zeros and the multiplicity of any multiple zeros of:

30. $f(x) = x^3 - 3x^2 - 10x$

$x(x^2 - 3x - 10)$
 $x(x - 5)(x + 2)$

$0, 5, \text{ and } -2$

31. $f(x) = x^4 - 12x^2 - 64$

$(x^2 - 16)(x^2 + 4)$

$x^2 - 16 = 0$ $x^2 + 4 = 0$
 $x^2 = 16$ $x^2 = -4$
 $\sqrt{x^2} = \sqrt{16}$ $\sqrt{x^2} = \sqrt{-4}$
 ± 4 $\pm 2i$

32. $f(x) = 3x^4 + 21x^2 - 54$

$3(x^4 + 7x^2 - 18) = 0$

$3(x^2 + 9)(x^2 - 2) = 0$

$x^2 + 9 = 0$ $x^2 - 2 = 0$
 $x^2 = -9$ $x^2 = 2$
 $\sqrt{x^2} = \sqrt{-9}$ $\sqrt{x^2} = \sqrt{2}$
 $\pm 3i$ $\pm \sqrt{2}$

33. $f(x) = 2x^4 - 20x^3 + 50x^2$

$2x^2(x^2 - 10x + 25) = 0$

$2x^2(x - 5)(x - 5) = 0$

$0 \text{ mult of } 2, 5 \text{ mult of } 2$

34. $0 = x^5 + 6x^3 + 5x$

$x(x^4 + 6x^2 + 5) = 0$

$x(x^2 + 5)(x^2 + 1) = 0$

$x^2 + 5 = 0$ $x^2 + 1 = 0$
 $x^2 = -5$ $x^2 = -1$
 $\sqrt{x^2} = \sqrt{-5}$ $\sqrt{x^2} = \sqrt{-1}$
 $\pm i\sqrt{5}$ $\pm i$

35. $x^3 + 3x^2 = 4x + 12$

$x^3 + 3x^2 - 4x - 12 = 0$

$-3 \mid \begin{array}{cccc} 1 & 3 & -4 & -12 \\ \downarrow & -3 & 0 & 12 \\ \hline 1 & 0 & -4 & 0 \end{array}$

$x^2 - 4 = 0$
 $x^2 = 4$
 $\sqrt{x^2} = \sqrt{4}$
 ± 2 -3

36. $x^3 - x^2 + 2x = 2$

$x^3 - x^2 + 2x - 2 = 0$

$\begin{array}{cccc} 1 & -1 & 2 & -2 \\ \downarrow & 1 & 0 & 2 \\ \hline 1 & 0 & 2 & 0 \end{array}$

$x^2 + 2 = 0$
 $x^2 = -2$
 $\sqrt{x^2} = \sqrt{-2}$

$\pm i\sqrt{2}$