

**Lesson 4-1 and 4-2**

**Graph each function on graph paper.**

1.  $y = (x + 1)^2 - 3$

2.  $y = (x + 3)^2 + 1$

3.  $y = 2x^2 + 4$

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

**Identify the vertex, axis of symmetry, minimum or maximum value, y-intercept, and domain and range of each function.**

5.  $y = -\frac{1}{2}(x - 4)^2 - 10$

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

7. Marnie throws a softball straight up into the air. The ball leaves her hand when it is exactly 5 ft from the ground. The height  $h$  of the ball, in feet, can be written as a function of time  $t$ , in seconds, as  $h = -16t^2 + 40t + 5$ .

a. What is the maximum height the ball reaches?

b. Marnie catches the ball 5 ft from the ground. How long was the ball in the air?

**Lesson 4-4**

**Factor each expression.**

8.  $x^2 + 3x - 54$

9.  $4x^2 - 5x - 9$

10.  $x^2 - 36$

11.  $x^2 + 14x + 49$

12.  $5x^2 + 23x - 10$

13.  $4x^2 + 12x + 40$

**Lesson 4-5****Solve the following using square roots.**

14.  $4x^2 - 100 = 0$

15.  $x^2 - 30 = 10$

**Solve the following by factoring.**

16.  $x^2 + 3x + 2 = 0$

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

18.  $2x^2 + 3x - 2 = 0$

19.  $6x^2 + x - 1 = 0$

**Solve the following using a calculator. Round to the nearest thousandth.**

20.  $x^2 + 4x - 1 = 0$

21.  $2x^2 + 4x = 70$

**22. Solve the following using a calculator.** The expression  $P(x) = 2500x - 2x^2$  describes the profit of a company that customizes bulldozers when it customizes  $x$  bulldozers in a month.

**a.** How many bulldozers per month must the company customize to make the maximum possible profit? What is the maximum profit?

**b.** For what number of bulldozers per month is the profit at least \$750,000?

**Lessons 4-6 and 4-7****Solve the following by completing the square.**

**23.**  $x^2 + 4x + 4 = 0$

**24.**  $x^2 + 8x - 17 = 0$

**25.**  $2x^2 - 12x + 1 = 0$

**26.**  $3x^2 + 12x - 6 = 0$

**Rewrite the following functions in vertex form by completing the square.**

**27.**  $y = x^2 - 2x + 5$

**28.**  $y = x^2 + 4x - 1$

**Solve the following using the quadratic formula.**

**29.**  $x^2 + 5x + 8 = 4$

**30.**  $x^2 - 3x + 7 = 0$

**Evaluate the discriminant of each equation. Tell how many real solutions each equation has.**

31.  $x^2 + 4x = 17$

32.  $2x^2 + x = -1$

**33. Use a calculator to solve.** An archer's arrow follows a parabolic path. The path of the arrow can be described by the equation  $y = -0.005x^2 + 2x + 5$ .

- a. Describe the meaning of the  $y$ -intercept of the graph of the equation.
  
  
  
  
  
  
  
  
  
  
- b. What is the horizontal distance the arrow travels before it hits the ground? Round your answer to the nearest foot.

### Lesson 4-8

**Simplify each number by using the imaginary number  $i$ .**

34.  $\sqrt{-9}$

35.  $\sqrt{-175}$

36.  $\sqrt{-80}$

**Simplify each expression.**

37.  $\frac{3 + i}{5 - 2i}$

38.  $(4 + 2i)(1 - i)$

39.  $(4 + 2i) - (3 + 5i)$

40.  $(2 - 5i)^2$