

- 1.** A signal flare is fired into the air from a boat. The height h of the flare in feet after t seconds is $h = -16t^2 + 160t$.
 - a.** How high will the flare travel? When will it reach this maximum height?
 - b.** When will the flare hit the water?
 - c.** Explain how you could use a table and a graph to answer the questions in parts (a) and (b).

- 5.** Kelsey jumps from a diving board, springing up into the air and then dropping feet-first. The distance d in feet from her feet to the pool's surface t seconds after she jumps is $d = -16t^2 + 18t + 10$.
- a.** What is the maximum height of Kelsey's feet during this jump? When does the maximum height occur?
 - b.** When do Kelsey's feet hit the water?
 - c.** What does the constant term 10 in the equation tell you about Kelsey's jump?



- 6.** The equation $h = -16t^2 + 48t + 8$ describes how the height h of a ball in feet changes over time t .
- a.** What is the maximum height reached by the ball? Explain how you could use a table and a graph to find the answer.
 - b.** When does the ball hit the ground? Explain how you could use a table and a graph to find the answer.
 - c.** Describe the pattern of change in the height of the ball over time. Explain how this pattern would appear in a table and a graph.
 - d.** What does the constant term 8 mean in this context?



For Exercises 7–10, do parts (a)–(d) without a calculator.

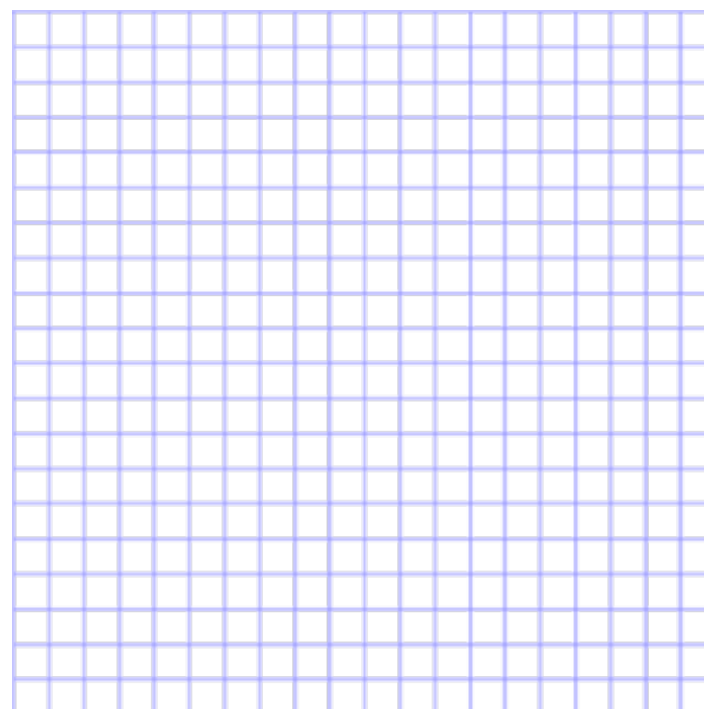
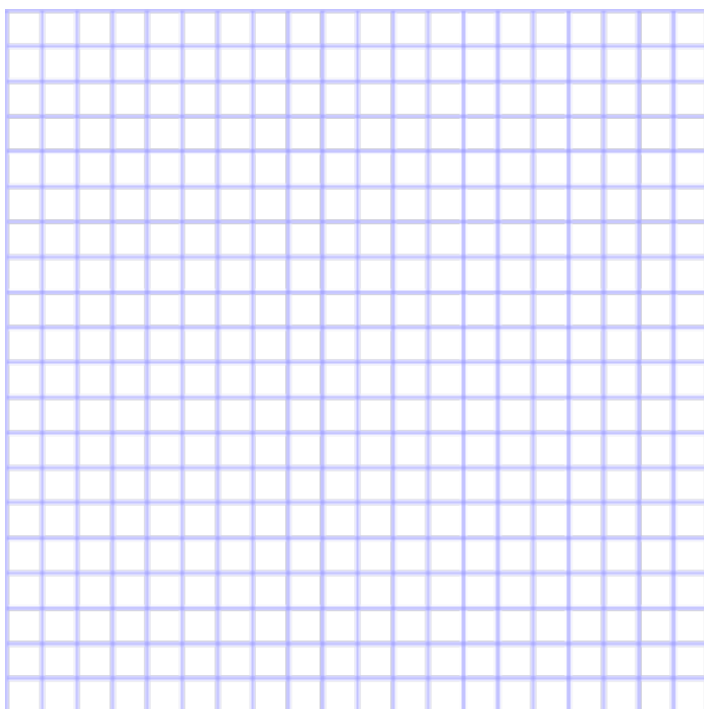
- a.** Sketch a graph of the equation.
- b.** Find the x - and y -intercepts. Label these points on your graph.
- c.** Draw and label the line of symmetry.
- d.** Label the coordinates of the maximum or minimum point.

7. $y = 9 - x^2$

8. $y = 2x^2 - 4x$

9. $y = 6x - x^2$

10. $y = x^2 + 6x + 8$



- 11. a.** How can you tell from a quadratic equation whether the graph will have a maximum point or a minimum point?
- b.** How are the x - and y -intercepts of the graph of a quadratic function related to its equation?
- c.** How are the x - and y -intercepts related to the line of symmetry?

For Exercises 12–17, predict the shape of the graph of the equation. Give the maximum or minimum point, the x -intercepts, and the line of symmetry. Use a graphing calculator to check your predictions.

12. $y = x^2$

13. $y = -x^2$

14. $y = x^2 + 1$

15. $y = x^2 + 6x + 9$

16. $y = x^2 - 2$

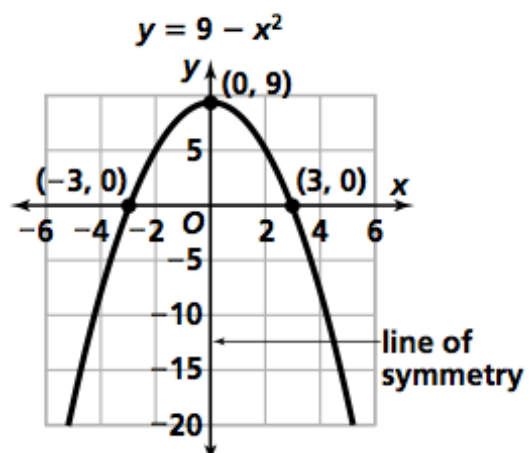
17. $y = x(4 - x)$

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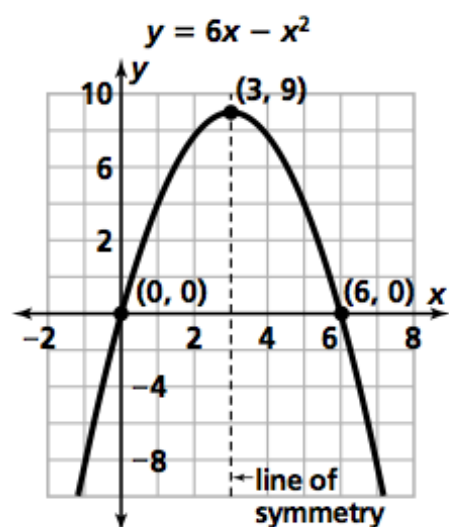
1.
 - a. At 5 seconds, the flare will have traveled to a maximum height of 400 ft.
 - b. The flare will hit the water when the height is 0 ft, which will occur at 10 s.
 - c. In a graph, the maximum point represents the maximum height of the flare, and the right-hand x -intercept represents the point at which the flare hits the water. In a table, the entry for when the height is its greatest represents the maximum height reached by the flare, and the entry for when the height is once again 0 represents the point at which the flare hits the water.
5.
 - a. The maximum height is about 15.06 ft, which occurs after about 0.56 seconds. (Note: Students can find this by making a table or a graph of the equations.)
 - b. Her feet hit the water when the height is 0, which occurs at about 1.53 seconds.
 - c. The board is 10 ft above the water's surface.
6.
 - a. The maximum height is 44 ft, which is reached at 1.5 seconds. You could find this in a table of time versus height by locating the maximum height. You could find this in a graph by determining the height at the maximum point of the parabola.
 - b. The ball hits the ground just after 3.1 seconds. You could find this in a table of time versus height by locating the value for time when height is 0. You could find this in a graph by determining the time at the point at which the parabola crosses the x -axis.
 - c. The ball begins rising rapidly and then slows its ascent until it reaches the maximum height of 44 ft. It then starts to fall, slowly at first and gaining speed on the way down until it hits the ground.
 - d. The ball is 8 ft above ground when thrown.

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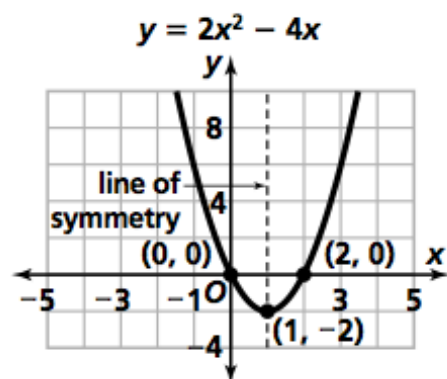
7.



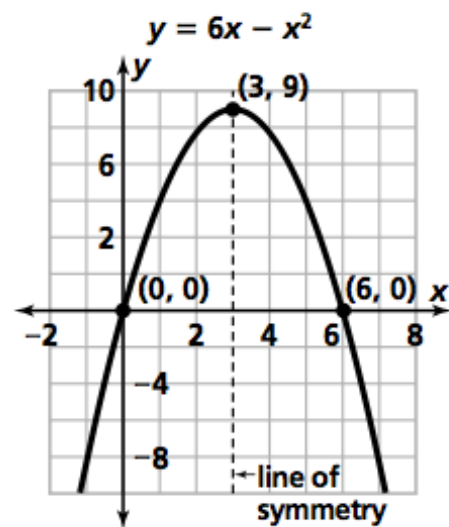
9.



8.



9.



- 11. a.** If the sign of the coefficient of the x^2 term is negative, the graph will have a maximum point. If it is positive, the graph will have a minimum point.
- b.** The x -intercepts are the values that make each factor in the factored form of the equation equal to 0. The y -intercept is the constant term in the expanded form of the equation.
- c.** If there are two x -intercepts, the distances from each x -intercept to the line of symmetry are the same. If there is only one intercept, it is on the line of symmetry. There is not any apparent relationship between the y -intercept and the line of symmetry.