Lesson 24 Practice Problems

1. The function h represents the height of an object t seconds after it is launched into the air. The function is defined by $h(t) = -5t^2 + 20t + 18$. Height is measured in meters.

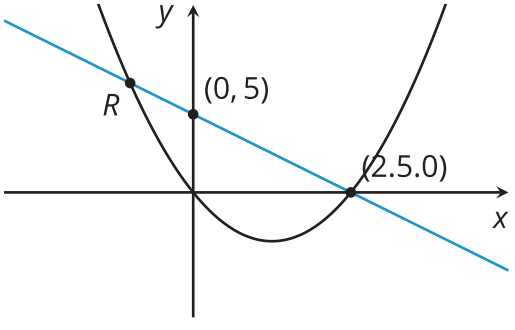
   Answer each question without graphing. Explain or show your reasoning.

   a. After how many seconds does the object reach a height of 33 meters?

   b. When does the object reach its maximum height?

   c. What is the maximum height the object reaches?

2. The graphs that represent a linear function and a quadratic function are shown here.



   The quadratic function is defined by $2x^2 - 5x$.

   Find the coordinates of R without using graphing technology. Show your reasoning.

3. Diego finds his neighbor's baseball in his yard, about 10 feet away from a five-foot fence. He wants to return the ball to his neighbors, so he tosses the baseball in the direction of the fence.

   Function h, defined by $h(x) = -0.078x^2 + 0.7x + 5.5$, gives the height of the ball as a function of the horizontal distance away from Diego.

   Does the ball clear the fence? Explain or show your reasoning.

4. Clare says, "I know that $\sqrt{3}$ is an irrational number because its decimal never terminates or forms a repeating pattern. I also know that $\frac{2}{9}$ is a rational number because its decimal forms a repeating pattern. But I don't know how to add or multiply these decimals, so I am not sure if $\sqrt{3} + \frac{2}{9}$ and $\sqrt{3} \cdot \frac{2}{9}$ are rational or irrational."

   a. Here is an argument that explains why $\sqrt{3} + \frac{2}{9}$ is irrational. Complete the missing parts of the argument.

      i. Let $x = \sqrt{3} + \frac{2}{9}$. If x were rational, then $x - \frac{2}{9}$ would also be rational because . . . .

      ii. But $x - \frac{2}{9}$ is not rational because . . . .

      iii. Since x is not rational, it must be . . . .

   b. Use the same type of argument to explain why $\sqrt{3} \cdot \frac{2}{9}$ is irrational.

   (From Unit 7, Lesson 21.)

5. The following expressions all define the same quadratic function.

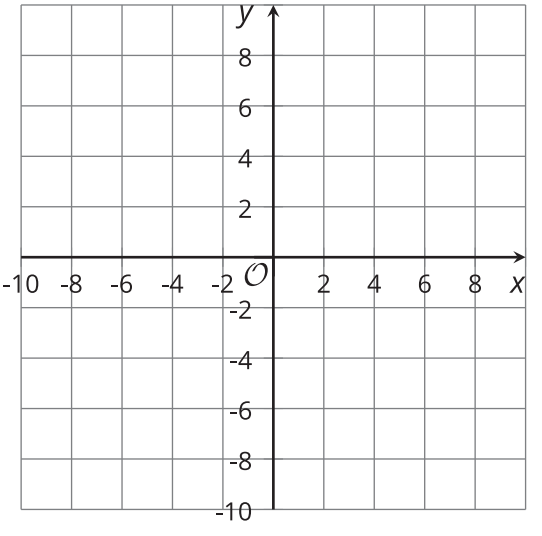
$x^2 + 2x - 8$ $(x + 4)(x - 2)$ $(x + 1)^2 - 9$

a. What is the y-intercept of the graph of the function?

b. What are the x-intercepts of the graph?

c. What is the vertex of the graph?

d. Sketch a graph of the quadratic function without using technology. Make sure the x-intercepts, y-intercept, and vertex are plotted accurately.



(From Unit 7, Lesson 22.)

6. Here are two quadratic functions: $f(x) = (x + 5)^2 + \frac{1}{2}$ and $g(x) = (x + 5)^2 + 1$.

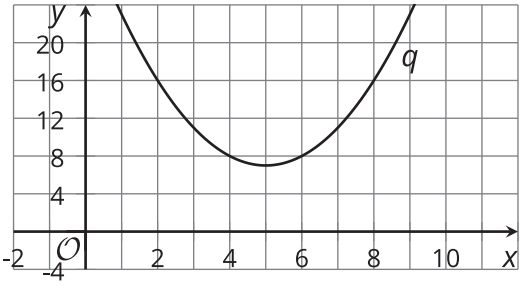
Andre says that both f and g have a minimum value, and that the minimum value of f is less than that of g. Do you agree? Explain your reasoning.

(From Unit 7, Lesson 23.)

7. Function p is defined by the equation $p(x) = (x + 10)^2 - 3$.

Function q is represented by this graph.

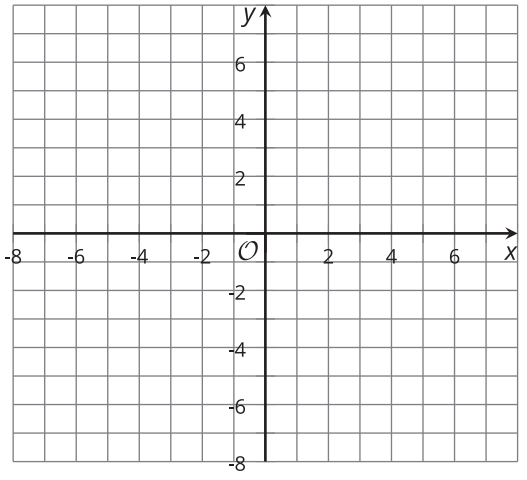
Which function has the smaller minimum? Explain your reasoning.



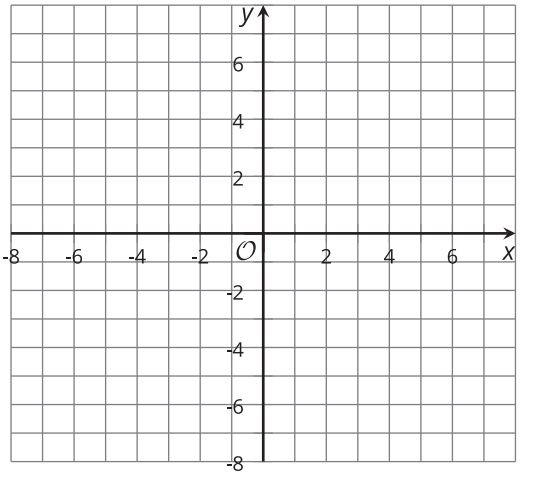
(From Unit 7, Lesson 23.)

8. Without using graphing technology, sketch a graph that represents each quadratic function. Make sure the x-intercepts, y-intercept, and vertex are plotted accurately.

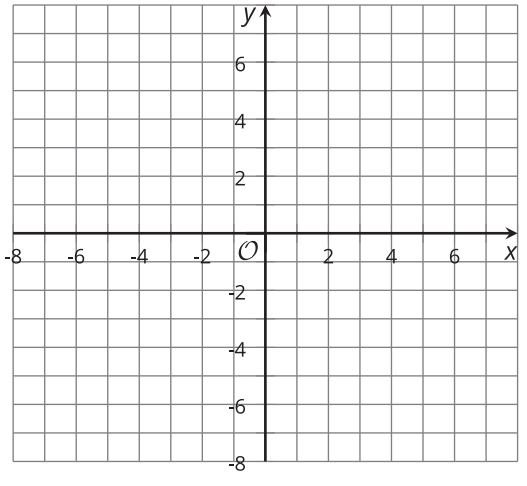
$f(x) = x^2 + 4x + 3$



$g(x) = x^2 - 4x + 3$



$h(x) = x^2 - 11x + 28$



(From Unit 7, Lesson 22.)