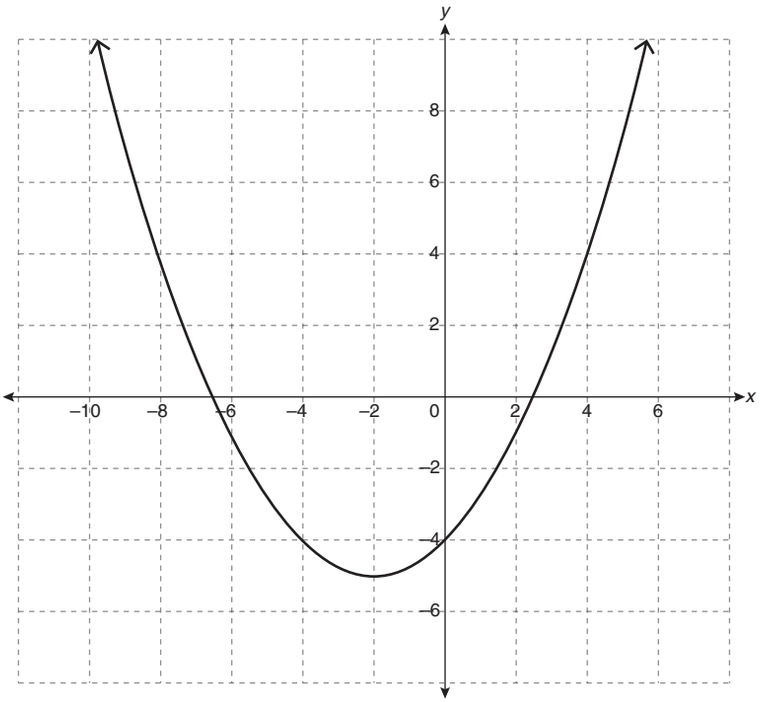
Practice Solutions – II

1. In vertex form, determine the equation of the following quadratic functions.

a.



vertex: $(-2, -5)$

$p = -2$

$q = -5$

$y-$ intercept: $(0, -4)$

$f(x) = a(x-p)^2 + q$

$f(x) = a(x+2)^2 - 5$

Substitute (0, 4), the y-intercept, into the equation, and solve for a.

$f(x) = a(x+2)^2 - 5$

$-4 = a(0+2)^2 - 5$

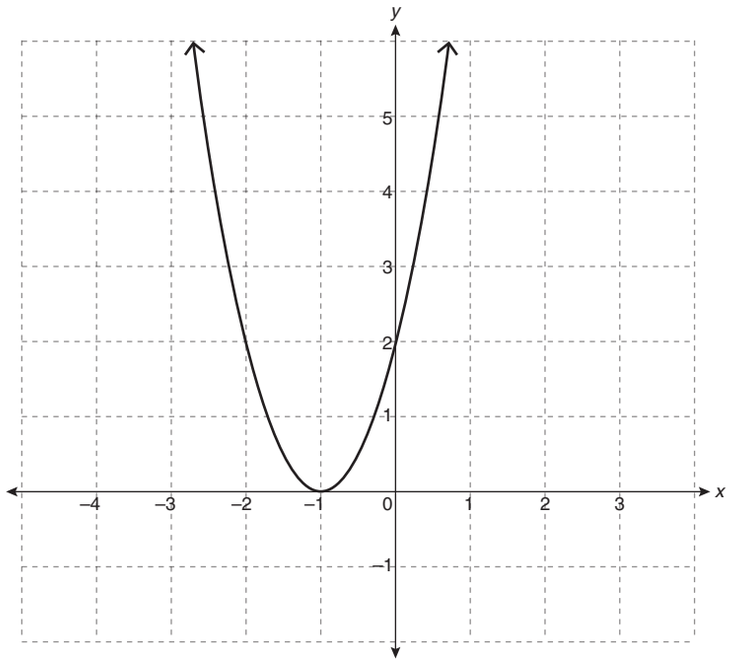
$1 = 4a$

$\frac{1}{4} = a$

Write the equation of the function.

$f(x) = \frac{1}{4}(x+2)^2 - 5$

b.



vertex: $(-1, 0)$

$p = -1$

$q = 0$

$y-$ intercept: $(0, 2)$

$f(x) = a(x - p)^2 + q$

$f(x) = a(x + 1)^2$

Substitute (0, 2), the y-intercept, into the equation, and solve for a.

$f(x) = a(x + 1)^2$

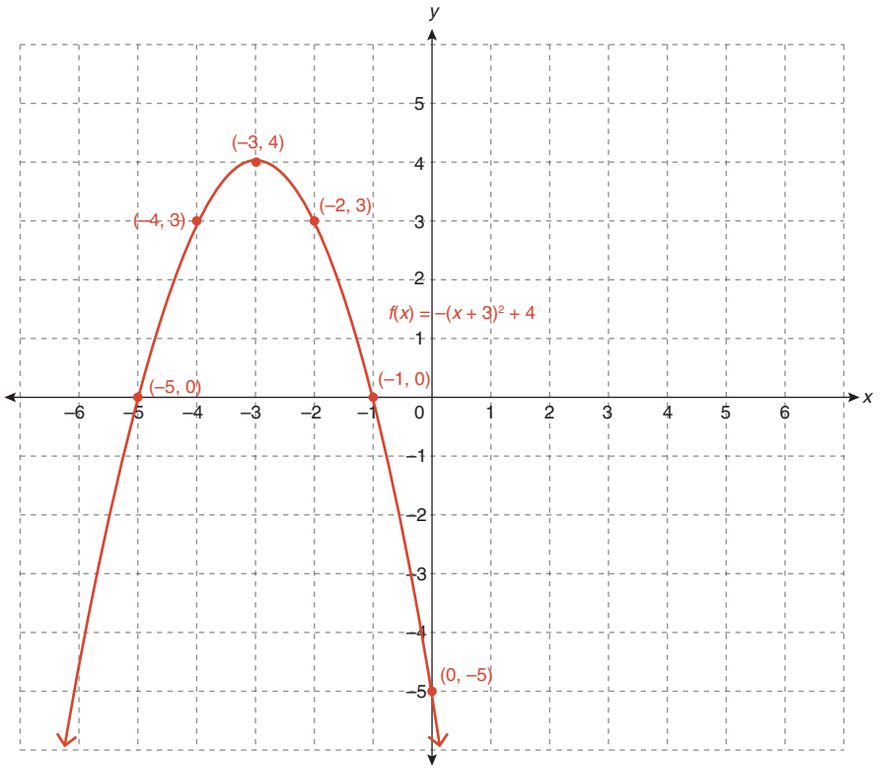
$2 = a(0 + 1)^2$

$2 = a$

Write the equation of the function.

$f(x) = 2(x + 1)^2$

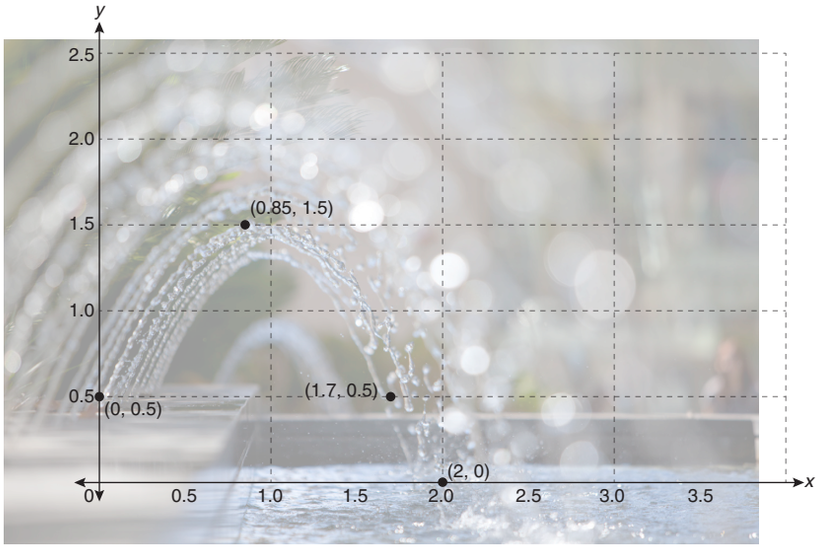
2. Sketch the graph of the function $f(x) = -(x+3)^2 + 4$. Be sure to label at least 5 points, including the vertex, x-intercept(s), and y-intercept, if applicable. Verify by using a graphing calculator.



x	$f(x)$
-5	$f(-5) = -(-5+3)^2 + 4 = 0$
-4	$f(-4) = -(-4+3)^2 + 4 = 3$
-3	4
-2	$f(-2) = -(-2+3)^2 + 4 = 3$
-1	$f(-1) = -(-1+3)^2 + 4 = 0$
0	$f(0) = -(0+3)^2 + 4 = -5$

3. A fountain has a spray that follows a quadratic trajectory. The water starts at 0.5 m above the ground, and reaches its peak at a height of 1.5 m, when it is 0.85 m away from its starting point.

   a. Draw a diagram of the fountain's spray, including known values.



   b. How far away from the starting point will the water be 0.5 m above the ground again?

   The water will be 0.5 m above the ground again, at a point 0.85 m on the other side of the vertex because quadratic functions are symmetrical about the x-value of the vertex. This will be $2(0.85) = 1.7$ m away from the start. (See diagram.)

   c. Write the equation of the function.

   $p = 0.85$ and $q = 1.5$

   $f(x) = a(x - 0.85)^2 + 1.5$

   To solve for a, use the known point (0, 0.5).

   $$f(x) = a(x - 0.85)^2 + 1.5$$
   $$0.5 = a(0 - 0.85)^2 + 1.5$$
   $$-1 = a(0.7225)$$
   $$-1.384... = a$$

   Then, write the equation of the function using a, p, and q.

   $f(x) = -1.384...(x - 0.85)^2 + 1.5$

d. The water is supposed to land in a basin on the ground, 2 m away from the start. Does the spray hit the basin?

Use the equation above, and evaluate $f(2)$.

$f(x) = -1.384...(x - 0.85)^2 + 1.5$

$f(2) = -1.384...(2 - 0.85)^2 + 1.5$

$f(2) = -0.330...$

Because $f(2)$ is less than 0, this indicates that the fountain's spray hits the ground prior to the basin. The basin needs to be moved closer to the start of the spray, or the spray's pressure needs to be increased so that it sprays farther.

Please complete *Lesson 2.1 Explore Your Understanding Assignment located in Workbook 2A* before proceeding to *Lesson 2.2*.