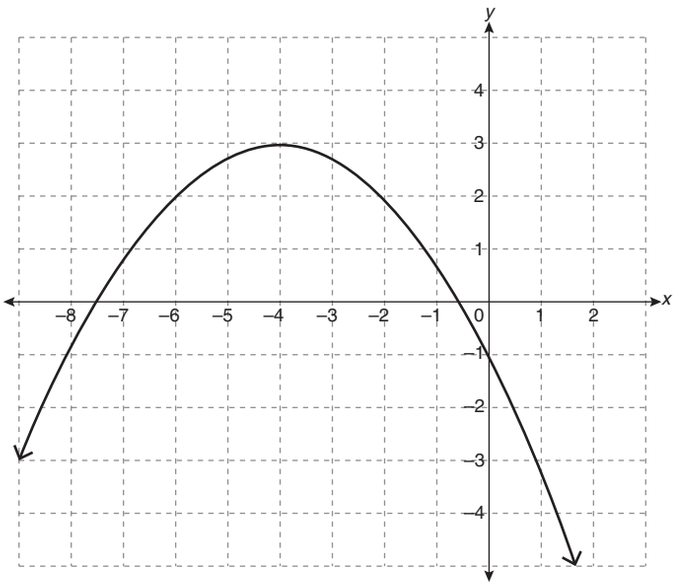
Lesson 2.1: Quadratic Functions Expressed in Vertex Form

Explore Your Understanding Assignment

This assignment includes multiple choice and short answer questions. For multiple choice questions, select the best answer. Each is worth 1 mark. Marks assigned to short answer questions are indicated for each question. Be sure to show all necessary work.

Use the following graph of a quadratic function to answer questions 1 and 2.



(1) _____ 1. The values of p and q are

A. $p = 4; q = 3$
B. $p = 4; q = -3$
C. $p = -4; q = 3$
D. $p = -4; q = -3$

(1) _____ 2. Which statement best describes the range of the function?

A. $\{y \mid y \leq 3, y \in \mathrm{R}\}$ because $a > 0$
B. $\{y \mid y \leq 3, y \in \mathrm{R}\}$ because $a < 0$
C. $\{y \mid y \geq 3, y \in \mathrm{R}\}$ because $a > 0$
D. $\{y \mid y \geq 3, y \in \mathrm{R}\}$ because $a < 0$

Use the following quadratic function to answer questions 3 to 6.

$$f(x) = \frac{2}{3}(x-4)^2 + 2$$

(1) _____ 3. Choose the correct statement with regards to x-intercepts.

A. The graph of the function has zero x-intercepts because a and q are both positive.
B. The graph of the function has zero x-intercepts because a and p are both positive.
C. The graph of the function has two x-intercepts because a and q are both positive.
D. The graph of the function has two x-intercepts because a and p are both positive.

(1) _____ 4. The vertex of the function has coordinates of

A. (–4, –2)
B. (–4, 2)
C. (4, –2)
D. (4, 2)

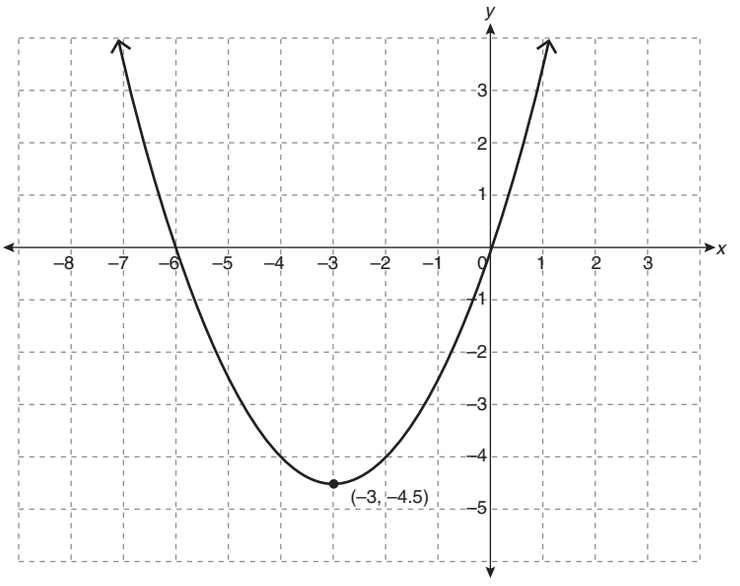
(1) _____ 5. The axis of symmetry is the line

A. $x = -4$
B. $x = 4$
C. $y = -2$
D. $y = 2$

(1) _____ 6. Which statement correctly provides the direction of opening and the maximum/minimum value of the function?

A. The graph of $f(x)$ opens downward and has a maximum value of 2
B. The graph of $f(x)$ opens downward and has a minimum value of 2
C. The graph of $f(x)$ opens upward and has a minimum value of 2
D. The graph of $f(x)$ opens upward and has a maximum value of 2

Use the following graph of a quadratic function to answer question 7.



(1) _____ 7. Write the equation of the quadratic function in vertex form.

A. $f(x) = 1.5(x-3)^2 - 4.5$

B. $f(x) = 1.5(x+3)^2 - 4.5$

C. $f(x) = 0.5(x-3)^2 - 4.5$

D. $f(x) = 0.5(x+3)^2 - 4.5$

(1) _____ 8. Describe the transformations required to change the graph of $f(x) = x^2$ into the graph of $g(x) = -2(x+3)^2 + 1$.

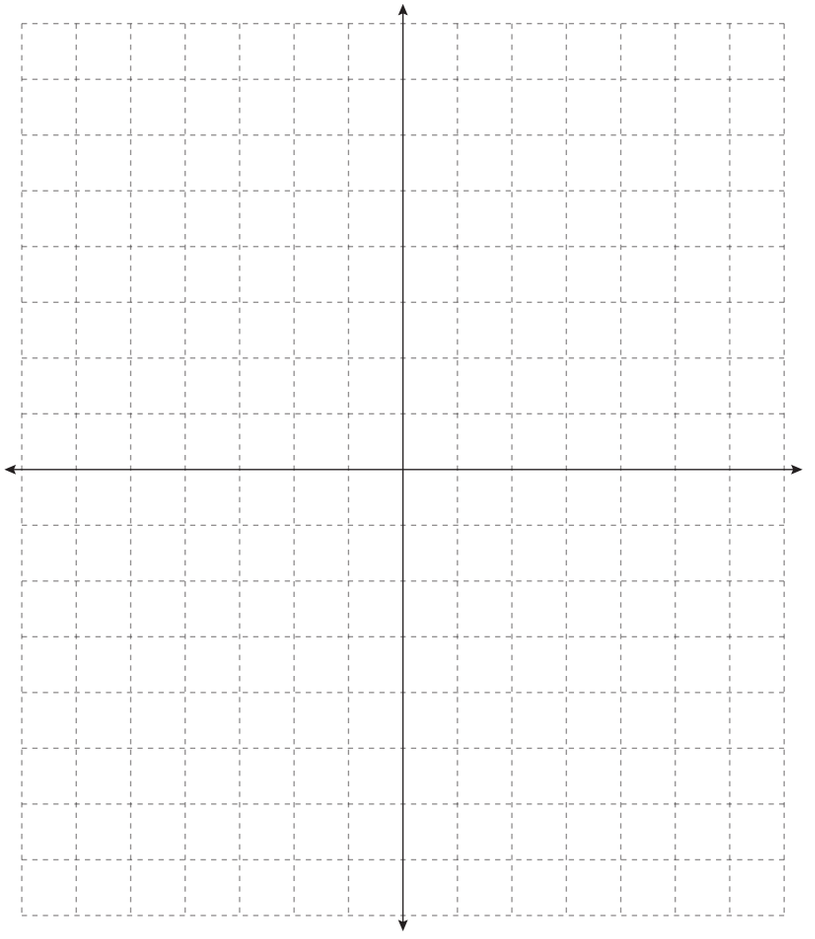
A. Stretch the graph of the function by a factor of –2, and then translate the graph 3 units to the left and 1 unit up.

B. Stretch the graph of the function by a factor of –2, and then translate the graph 3 units to the right and 1 unit up.

C. Translate the graph of the function 3 units to the left and 1 unit up, and then stretch the graph by a factor of –2.

D. Translate the graph of the function 3 units to the right and 1 unit up, and then stretch the graph by a factor of –2.

(3) 9. Sketch the graph of $f(x) = 1.5(x-1)^2 - 6$. Be sure to label the axes and at least 5 points, including the vertex, x-intercept(s), and y-intercept(s), if applicable.



10. Adrianne is playing soccer, and kicks the ball at the goal. The ball follows the path of a quadratic function. When she kicks the ball, she is 20 feet away from the goal, and the ball hits a maximum height of 10 feet when it is 5 feet away from the goal line. If the net is 8 feet tall, does she make a goal (assuming the goalie does not stop the ball)?

(1) a. Draw a diagram of the situation, including known values.

(2) b. Determine the quadratic function that models the situation.

(1) c. Given the information, determine whether Adrianne makes a goal.

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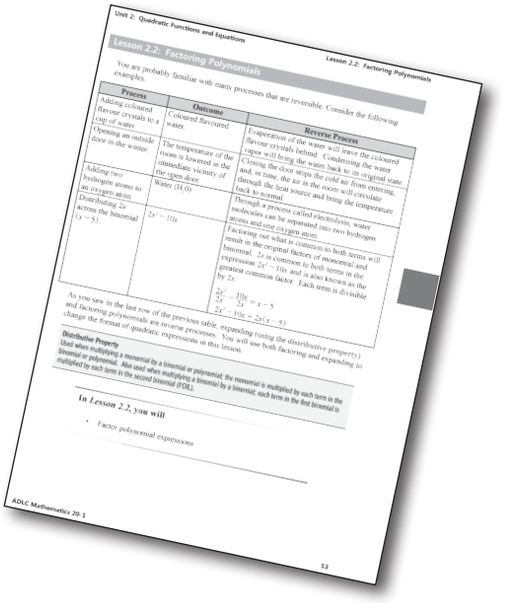
You have completed *Lesson 2.1 Explore Your Understanding Assignment*. Please return to the *Module* and continue your exploration with *Lesson 2.2*.



Unit 2: Quadratic Functions and Equations — Lesson 2.2: Factoring Polynomials

Lesson 2.2: Factoring Polynomials

You are probably familiar with many processes that are reversible. Consider the following examples.

Process	Outcome	Reverse Process
Adding coloured flavour crystals to a cup of water	Coloured flavoured water	Evaporation of the water will leave the coloured flavour crystals behind. Condensing the water vapor will bring the water back to its original state.
Opening an outside door in the winter.	The temperature of the room is lowered in the immediate vicinity of the open door.	Closing the door stops the cold air from entering, and, in time, the air in the room will circulate through the heat source and bring the temperature back to normal.
Adding two hydrogen atoms to an oxygen atom.	Water (H_2O)	Through a process called electrolysis, water molecules can be separated into two hydrogen atoms and one oxygen atom.
Distributing $2x$ across the binomial $(x - 5)$.	$2x^2 - 10x$	Factoring out what is common to both terms will result in the original factors of monomial and binomial. $2x$ is common to both terms in the expression $2x^2 - 10x$ and is also known as the greatest common factor. Each term is divisible by $2x$. $\frac{2x^2}{2x} - \frac{10x}{2x} = x - 5$ $2x^2 - 10x = 2x(x - 5)$

As you saw in the last row of the previous table, expanding (using the distributive property) and factoring polynomials are reverse processes. You will use both factoring and expanding to change the format of quadratic expressions in this lesson.

Distributive Property
(Used when multiplying a monomial by a binomial or polynomial, the monomial is multiplied by each term in the binomial or polynomial. Also used when multiplying a binomial by a binomial, each term in the first binomial is multiplied by each term in the second binomial (FOIL).

In *Lesson 2.2*, you will

- Factor polynomial expressions

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