

# FUNCTIONS

## What Are Functions?

A **function** is a rule that is performed on a number, called an input, to produce a result called an output. The rule consists of one or more mathematical operations that are performed on the input.

- An example of a function is  $y = 2x + 3$ , where  $x$  is the input and  $y$  is the output. The operations of multiplication and addition are performed on the input,  $x$ , to produce the output,  $y$ . By substituting a number for  $x$ , an output can be determined.

- A table can also be used to show input and output values. In this

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### PREVIEW

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An **exponential function**,  $y = a^x$ , is a curved line that gets closer to but does not touch the  $x$ -axis. A line that comes close to but never touches the  $x$ -axis is called a **horizontal asymptote**.

- An exponential function can be graphed by substituting numbers in for  $x$  and determining the value of  $y$  and then plotting the points on the coordinate plane.

A **quadratic function**,  $y = ax^2 + bx + c$ , produces a parabola when graphed. A parabola is a U-shaped line that can either be facing up or facing down.

- The point where a parabola is at its minimum or maximum is called the **turning point or vertex**.
- The **axis of symmetry** is the line that cuts the parabola into two equal mirror images.
- A quadratic function can be graphed by substituting numbers in for **x** and determining the value of **y** and then plotting the points on the coordinate plane.

Functions represent variables and how they are related to one another.

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intercept of the line. When the slope and y-intercept are substituted into the equation, the function is determined. The graph of a linear function is a straight line.

An **exponential function** is always in the form of  $y = a^x$ . When graphed it is a curved line that comes close to, but never touches the x-axis.

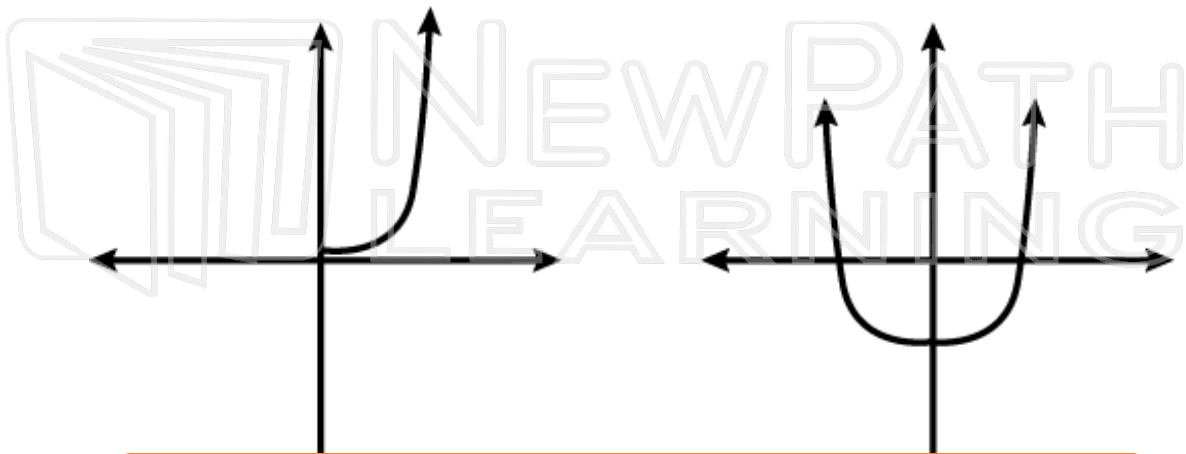
A **quadratic function** is always in the form,  $y = ax^2 + bx + c$ . When graphed, it is a parabola. The axis of symmetry and turning point can be found with the equation,  $x = -b/2a$ , where **a** and **b** are the coefficients of the first and second terms in the equation. When **x** is found, it is substituted into the equation to find **y**, and therefore the coordinate of the turning point.



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Functions need to be recognized on a graph. The figures show the two types of nonlinear functions.



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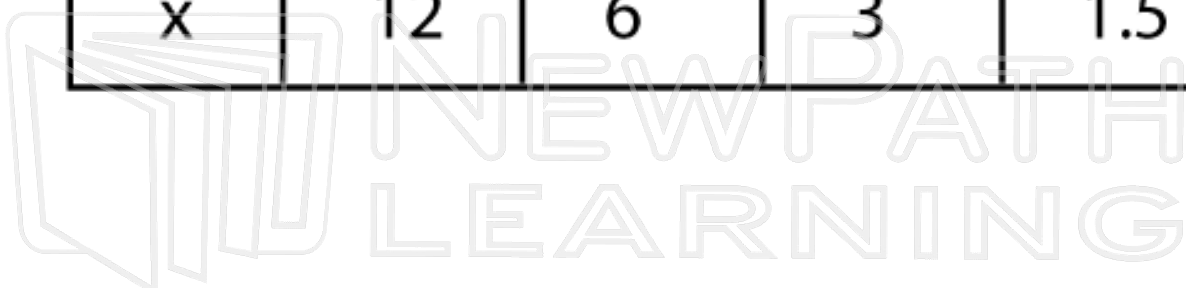


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y	9	18	36	72
x	12	6	3	1.5



## Try This!

1. What are the  $y$  values for the **linear function**,  $y = -3x + 6$  when the  $x$  values are  $-3, -2, -1$ ?

2. What are the  $y$  values for the **exponential function**,  $y = 2^x$  when the  $x$  values are  $-1, 0, 1$ ?

3. What are the  $y$  values for the **quadratic function**,  $y = x^2 + 2x - 4$

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6. If  $y$  **varies inversely** as  $x$ , and  $y = 7$  when  $x = 5$ , what is the constant of variation?