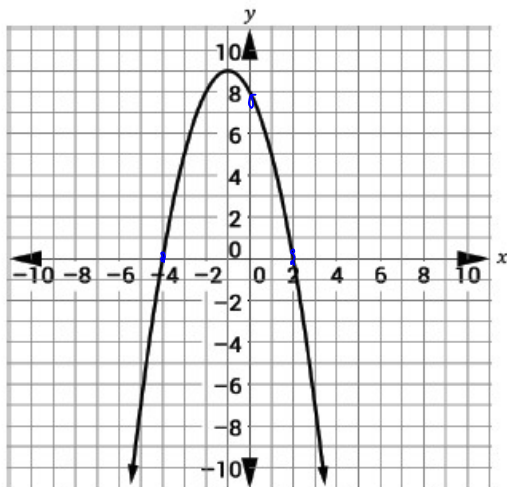


section 5 - topic 2
Writing Quadratic Equations in Standard Form from a
Graph

Let's discover how can we use a graph to write the equation of a quadratic function.

Consider the following graph.



What information can you gather by examining the graph?

vertex, Axis of Symm, x-int, y-int

To write the equation in standard form, $y = ax^2 + bx + c$, we need to find the a , b , and c terms.

Identify the y-intercept.

This is the c term of standard form.

$$(0, 8) \quad c = 8$$

Identify the solutions. Write the solutions as linear factors.

$$x = -4, 2$$

$$a(x+4)(x-2)$$

Write the quadratic equation using the linear factors. Don't forget the a term.

$$a(x^2 - 2x + 4x - 8)$$

$$a(x^2 + 2x - 8)$$

$$ax^2 + 2ax - 8$$

Expand the quadratic equation.

$$ax^2 + 2ax - 8a$$

Set the c term in the equation above equal to the value of c and solve for a .

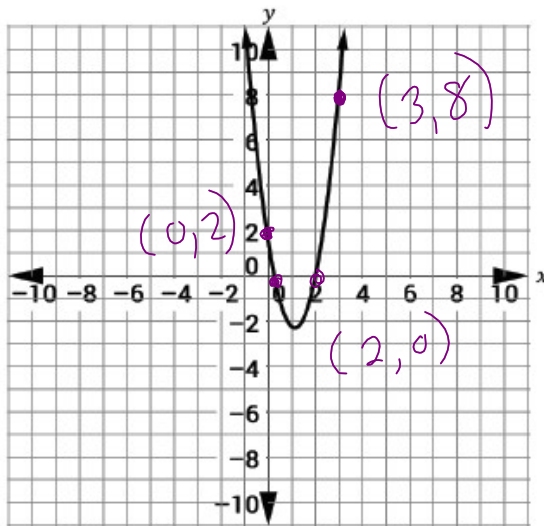
$$\begin{aligned} -8a &= c \\ -8a &= 8 \\ a &= -1 \end{aligned}$$

Substitute a in the previous step to write the quadratic equation represented by the graph.

$$\begin{aligned} &(-1)(x^2) + 2(-1)(x) - 8(-1) \\ y &= -x^2 - 2x + 8 \end{aligned}$$

Try it!

1. Write the equation for the graph below.



The following table shows a different way to find the equation of the quadratic.

$$y = ax^2 + bx + c$$

Identify two ordered pairs from the graph of the quadratic.

(x, y)

$$(3, 8), (2, 0)$$

Identify the y -intercept. This is the c term of standard form.

$$(0, 2) \quad c = 2$$

Substitute the ordered pairs and the c term into the standard form of a quadratic equation to write a system of linear equations.

$$8 = a(3)^2 + b(3) + 2$$

$$8 = 9a + 3b + 2$$

$$6 = 9a + 3b$$

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

$$0 = 4a + 2b + 2$$

$$-2 = 4a + 2b$$

Solve the system to find the value of a and b .

$$-2 = 12 + 2b$$

$$-14 = 2b \quad b = -7$$

$$(6 = 9a + 3b) \cdot 2$$

$$(-2 = 4a + 2b) \cdot -3$$

$$12 = 18a + 6b$$

$$+6 = -12a - 6b$$

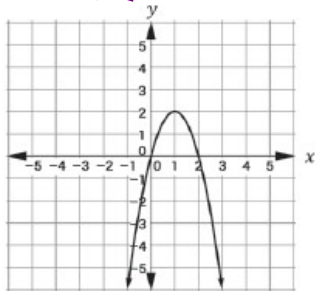
$$18 = 6a \quad a = 3$$

Substitute a , b , and c into the standard form of a quadratic equation to write the quadratic equation represented by the graph.

$$3x^2 - 7x + 2 = y$$

BEAT THE TEST!

1. A quadratic function $f(x)$ is shown below.



Select symbols and values to create the equation of the function shown above.

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

$f(x)$	-4	-4	-4
$g(x)$	-2	-2	-2
$h(x)$	-1	-1	-1
	0	0	0
	1	1	1
	2	2	2
	4	4	4

vertex $(1, 2)$ ✓
 x-int: $0, 2$ $(0, 0)$ $(2, 0)$ ✓
 y-int = 0 ✓

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

$0 = a(2)^2 + b(2)$
 $0 = 4a + 2b$

$-4 = -2a - 2b$
 $0 = 4a + 2b$

$-4 = 2a$ $a = -2$ $4 = b$

