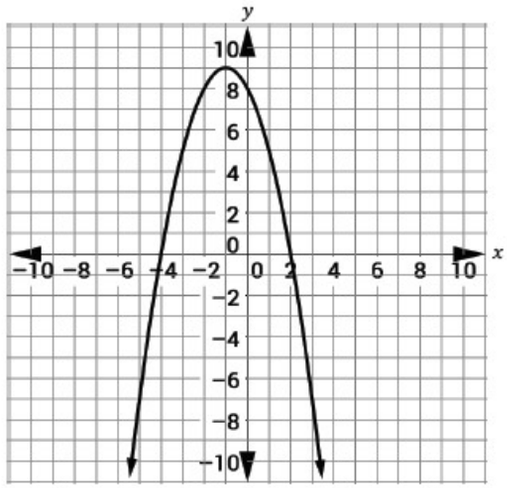
Section 5 – Topic 2
Writing Quadratic Equations in Standard Form from a Graph

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

Consider the following graph.



down
A.O.S $x=-1$
Vertex $(-1,9)$
y-int $=(0,8)$
x-int $=(-4,0)(2,0)$

What information can you gather by examining the graph?

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.

$c = 8$

Identify the solutions. Write the solutions as linear factors. (x-int)

$(-4, 0)$, $(2, 0)$

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

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

Expand the quadratic equation.

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

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

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

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

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

$$\frac{-8a}{-8} = \frac{8}{-8}$$

$$a = -1$$

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

$y = (-1)x^2 + 2(-1)(x) - 8(-1)$

$y = -x^2 - 2x + 8$

1) $c = 8$ $\quad y = ax^2 + bx + c$ $\quad y = -1x^2 - 2x + 8$

2) $(2,0), (-4,0)$

3) $0 = a(2)^2 + b(2) + 8$

$0 = 4a + 2b + 8$

$-8 \quad\quad -8$

$-8 = 4a + 2b$

$0 = a(-4)^2 + b(-4) + 8$

$0 = 16a - 4b + 8$

$-8 \quad\quad -8$

$-8 = 16a - 4b$

$(-8 = 4a + 2b)2$

$-8 = 16a - 4b$

$-16 = 8a + 4b$

$-8 = 16a - 4b$

$-24 = 24a / 24$ $\quad a = -1$

$-8 = 4(-1) + 2b$

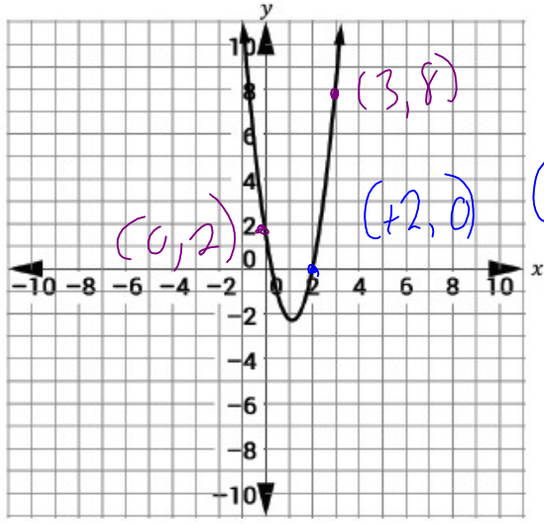
$-8 = -4 + 2b$

$+4 \quad +4$

$-4 = 2b$ $\quad b = -2$

Try it!

1. Write the equation for the graph below.



$c = 2$

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

$8 = 9a + 3b + 2$

$6 = 9a + 3b$

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

$0 = 4a + 2b + 2$

$-2 = 4a + 2b$

$(6 = 9a + 3b) - 2$

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

$-12 = -18a - 6b$

$-6 = 12a + 6b$

$\frac{-18}{-6} = \frac{-6a}{-6}$

$3 = a$

$6 = 9(3) + 3b$

$6 = 27 + 3b$

$-27 \quad -27$

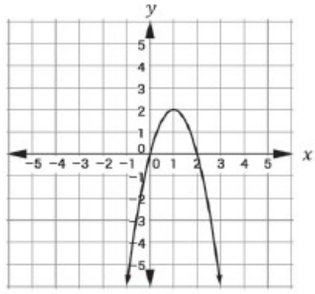
$\frac{-21}{3} = \frac{3b}{3}$

$-7 = b$

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

BEAT THE TEST!

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



vertex (1,2)

x-int (0,0)(2,0)

y-int (0,0)

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

$0=4a+2b$

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

$2=a+b$

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

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

$f(x)$	−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

$0=4a+2b$

$(2=a+b)-2$

$2=-2+b$

$+2 \quad +2$

$4=b$

$0=4a+2b$

$-4=-2a-2b$

$\frac{-4=2a}{2}$

$a=-2$