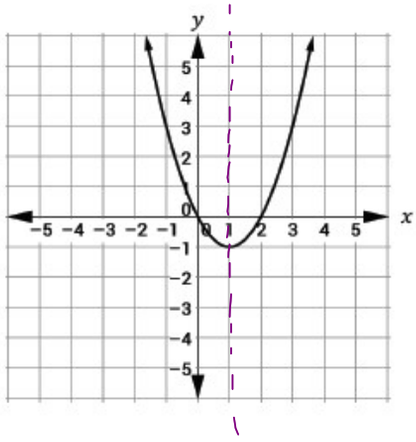
Section 5: Quadratic Equations and Functions – Part 2
Section 5 – Topic 1
Graphing Quadratic Functions in Standard Form

What information can we gather from the graph of the quadratic equation $y = x^2 - 2x$? Label all findings on the graph.



Opening Up or Down?	Up
Axis of symmetry:	$x = 1$
Vertex:	$(1, -1)$
x-intercept(s):	$x = 0, 2$
y-intercept:	$y = 0$ or $(0, 0)$

The standard form of a quadratic function is: $y = ax^2 + bx + c$

The information we gathered above can also be found by examining each term in the standard form of a quadratic equation. We can use this information to graph a quadratic function.

Let's Practice!

1. Consider the following quadratic function.

$f(x) = 3x^2 + 2x - 1$ $a = 3$ $b = 2$ $c = -1$

a. Complete the table below for $f(x)$.

Opening: If $a > 0$, quadratic opens upward. If $a < 0$, quadratic opens downward.	opens up
Axis of Symmetry: $x = \frac{-b}{2a}$ $x = \frac{-b}{2a}$	$x = \frac{-2}{6} =$ $x = -\frac{1}{3}$
Vertex: x –coordinate of vertex is equal to $\frac{-b}{2a}$. Substitute x –coordinate of the vertex into equation to find y –coordinate of the vertex.	$\left(-\frac{1}{3}, -\frac{4}{3}\right)$
***x*-intercepts:** Substitute 0 *for* y and solve for x.	$x = \frac{1}{3}, -1$
***y*-intercept:** Substitute 0 for x and solve for y. y-int = c	y-int = -1

$3\left(-\frac{1}{3}\right)^2 + 2\left(-\frac{1}{3}\right) - 1$

$\frac{3}{9} - \frac{2}{3} - 1$

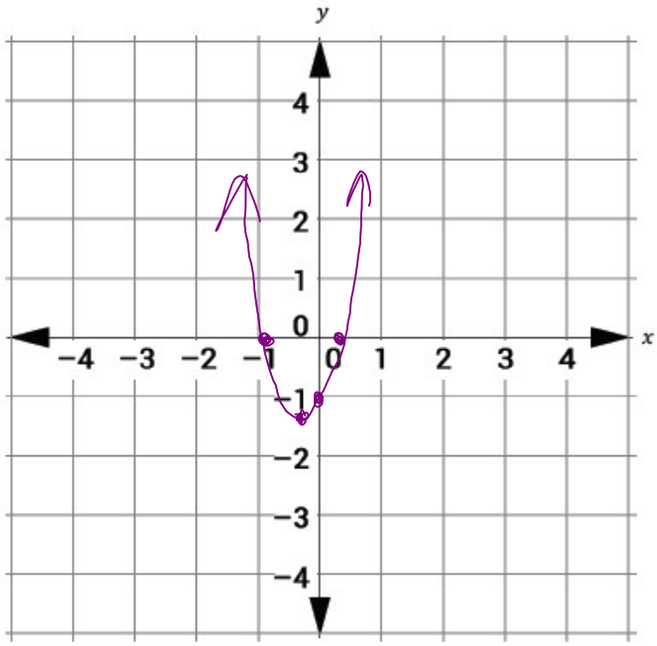
$\frac{1}{3} - \frac{2}{3} - \frac{3}{3} = -\frac{4}{3}$

$\frac{-2 \pm \sqrt{(2)^2 - 4(3)(-1)}}{2(3)}$

$\frac{-2 \pm \sqrt{16}}{6}$

$\frac{-2 \pm 4}{6}$ $\frac{-2+4}{6} = \frac{1}{3}$ $\frac{-2-4}{6} = -1$

b. Sketch the graph of $f(x)$.



c. What is the axis of symmetry? $x = -1/3$

d. Why do you think the c term is not used in the equation to find the axis of symmetry? c is the y-int

Try it!

2. Consider the following quadratic function.

$g(x) = 2x^2 - 4x - 1$ $A=2$ $B=-4$ $C=-1$

a. Complete the table below for $g(x)$.

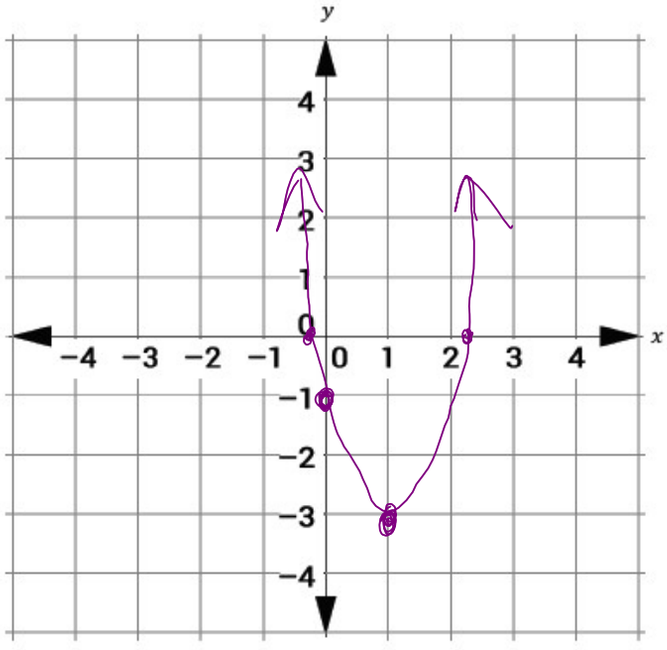
Opening: If $a > 0$, quadratic opens upward. If $a < 0$, quadratic opens downward.	opens up
Axis of Symmetry: $x = \frac{-b}{2a}$	$\frac{4}{2(2)} = 1$
Vertex: x –coordinate of vertex is equal to $\frac{-b}{2a}$. Substitute x-coordinate of the vertex into equation to find y –coordinate of the vertex.	$2(1)^2-4(1)-1$ $2-4-1=-3$ $(1,-3)$
***x*-intercepts**: Substitute 0 for y and solve for x.	$\frac{8.9}{4}$ $\frac{-0.9}{4}$ $x=2.2$ $x=-0.2$
***y*-intercept**: Substitute 0 for x and solve for y.	y-int = -1

$\frac{4 \pm \sqrt{(-4)^2-4(2)(-1)}}{2(2)}$

$\frac{4 \pm \sqrt{16+8}}{4}$

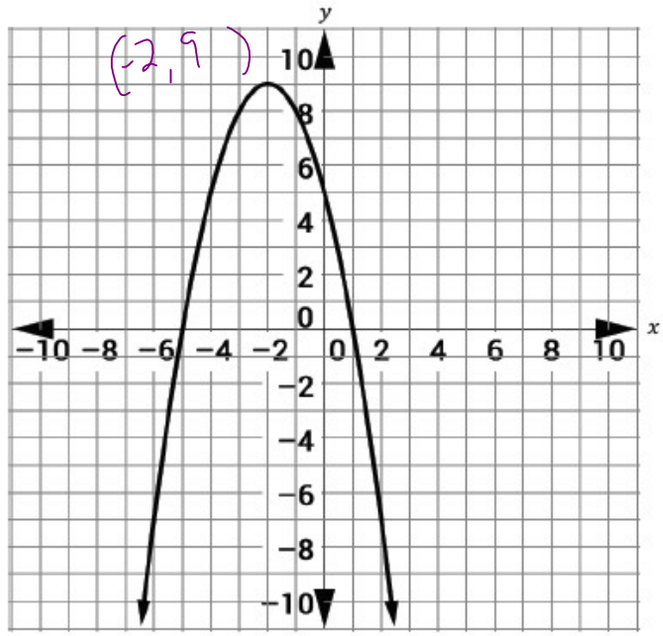
$\frac{4+\sqrt{24}}{4} = \frac{4 \pm 4.9}{4}$

b. Sketch the graph of $g(x)$.



BEAT THE TEST!

1. Consider the following graph.



$-2(-2)^2 - 8(-2) + 1$

$-8 + 16 + 1 = 9$

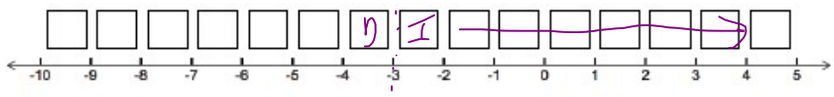
Which function has the same maximum as this graph?

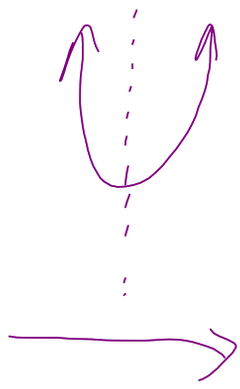
$x = \frac{-b}{2a} = \frac{8}{-4} = -2$

Ⓐ $f(x) = -2x^2 - 8x + 1$
Ⓑ $g(x) = -x^2 + 9x + 18$
Ⓒ $h(x) = x^2 + 4x + 15$
Ⓓ $m(x) = 3x^2 + 12x + 22$

2. Consider the function $f(x) = 9x^2 + 54x - 66$.

Over which intervals is the graph increasing, decreasing, or neither? Above each interval on the horizontal axis, write "I" to indicate an increasing interval, "D" to indicate a decreasing interval, or "N" to indicate neither.





$x = -\frac{b}{2a} = \frac{-54}{2(9)} = \frac{-54}{18} = -3$

set notation

Increasing $(-3, \infty)$

Decreasing $(-\infty, -3)$