

Chapter 9 Day 2:

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

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

Standard Form

Today we will be studying Vertex Form of a parabola.

$$y = a(x - h)^2 + k$$

$a > 0$ U min
 $a < 0$ ^ max

* (h, k) is the vertex

* if $a > 0$, opens up

* if $a < 0$, opens down

* axis of symmetry is ~~$y = h$~~ $x = h$

* minimum or maximum is k

Example: $y = 5(x + 4)^2 - 7$

Identify the vertex: $(-4, -7)$

Identify the axis of symmetry: $x = -4$

Identify the minimum or maximum: -7

Identify the y-intercept: $(0, -7)$

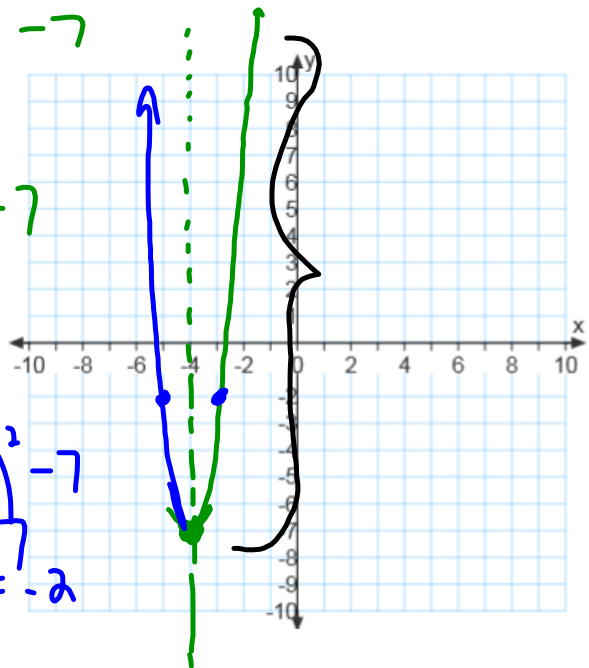
Domain: \mathbb{R}

Range: $y \geq -7$

X	Y
-3	-2
-5	-2

$y = 5(0+4)^2 - 7$
 $5 \cdot 4^2 - 7$
 $5 \cdot 16 - 7$
 $80 - 7$
 73

$y = 5(-3+4)^2 - 7$
 $5 \cdot 1 - 7$
 $5 - 7 = -2$



Example: $f(x) = \underline{\underline{2(x-1)^2 + 3}}$ ↻ ↻

Identify the vertex: $(1, 3)$

Identify the axis of symmetry: $x = 1$

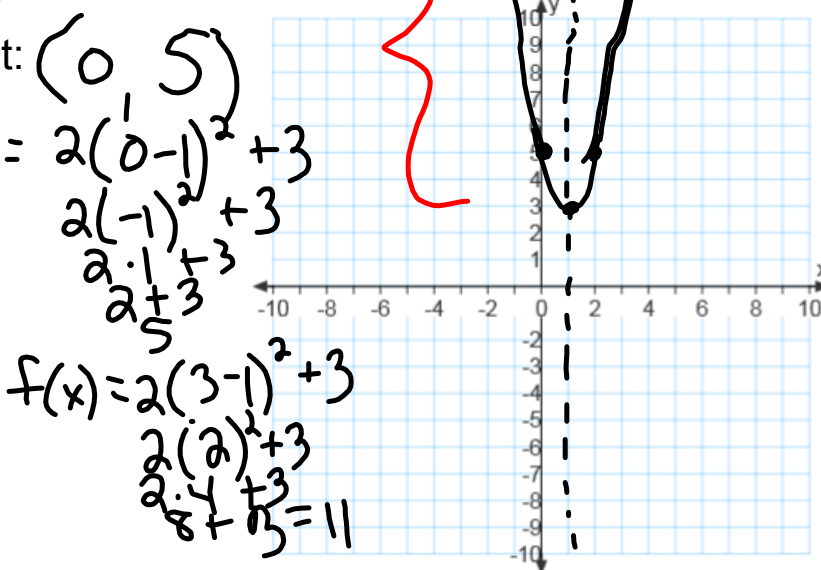
Identify the minimum or maximum: 3

Identify the y-intercept: $(0, 5)$

Domain: \mathbb{R}

Range: $y \geq 3$

X	Y
0	5
3	11



Example: $y = -(x + 3)^2 - 4$

Identify the vertex: $(-3, -4)$

Identify the axis of symmetry: $x = -3$

Identify the minimum or maximum: -4

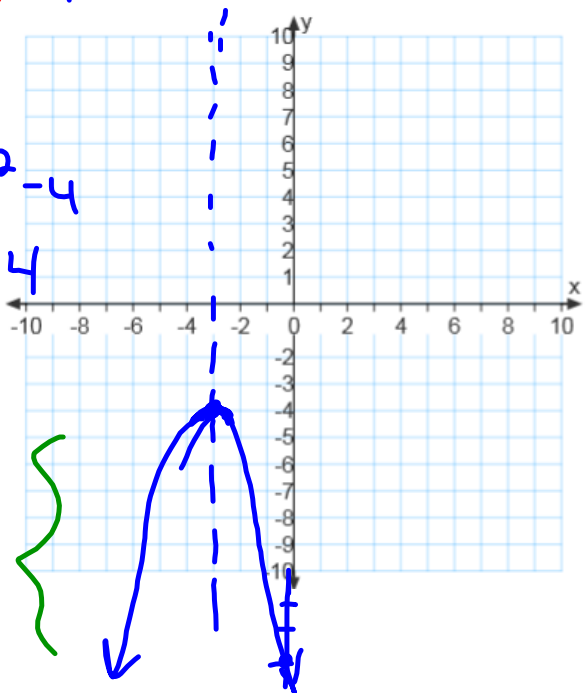
Identify the y-intercept:

Domain: \mathbb{R}

Range: $y \leq -4$

$(0, -13)$
 $y = -(0 + 3)^2 - 4$
 $= -(3)^2 - 4$
 $= -9 - 4$
 $= -13$

X	Y



Example: Change from vertex to standard form.

$$y = 3(x + 6)^2 - 2$$

$$ax^2 + bx + c$$

$$(x+6)(x+6)$$

$$x^2 + 6x + 6x + 36$$

$$3(x^2 + 12x + 36) - 2$$

$$3x^2 + 36x + 108 - 2$$

$$y = 3x^2 + 36x + 106$$

Identify $a = \underline{3}$, $b = \underline{36}$, and $c = \underline{106}$.

Example: Change from vertex to standard form.

$$\begin{aligned}
 f(x) &= -8(x-2)^2 + 3 \\
 &= -8(x-2)(x-2) + 3 \\
 &= -8(x^2 - 2x - 2x + 4) + 3 \\
 &= -8(x^2 - 4x + 4) + 3 \\
 &= -8x^2 + 32x - 32 + 3 \\
 &= -8x^2 + 32x - 29
 \end{aligned}$$

Identify $a = \underline{-8}$, $b = \underline{32}$, and $c = \underline{-29}$.