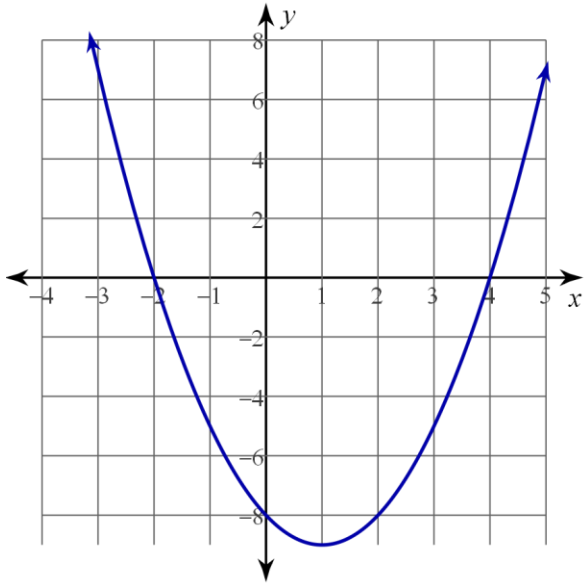
SM2 Lesson 5-2 (Intercept Form Quadratic Equation)



Factor the following quadratic expressions:

$x^2 + 11x + 30 \rightarrow (x + 5)(x + 6)$

$x^2 - 10x - 24 \rightarrow (x - 12)(x + 2)$

$x^2 - 8x + 15 \rightarrow (x - 5)(x - 3)$

Standard Form Quadratic Equation $y = ax^2 + bx + c$

$y = x^2 + 11x + 30$ $y = (x + 5)(x + 6)$

$y = x^2 - 10x - 24$ $y = (x - 12)(x + 2)$

$y = x^2 - 8x + 15$ $y = (x - 5)(x - 3)$

Intercept Form Quadratic Equation

$y = a(x - p)(x - q)$

Vocabulary

X-intercept: the x-y pair where the graph crosses the x-axis.

The y-value of an x-intercept always equals Zero

The Zero Product Property: Zero multiplied by any number equals zero (elementary school definition_.

The Zero Product Property: If two numbers are multiplied together and the product equals zero, then one or both of the factors must equal zero.

$$A * B = 0$$

$$\rightarrow \text{either } A = 0 \text{ or } B = 0 \text{ or both A and B equal zero.}$$

Intercept form Quadratic Equation

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

The y-value of an x-intercept always equals Zero

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

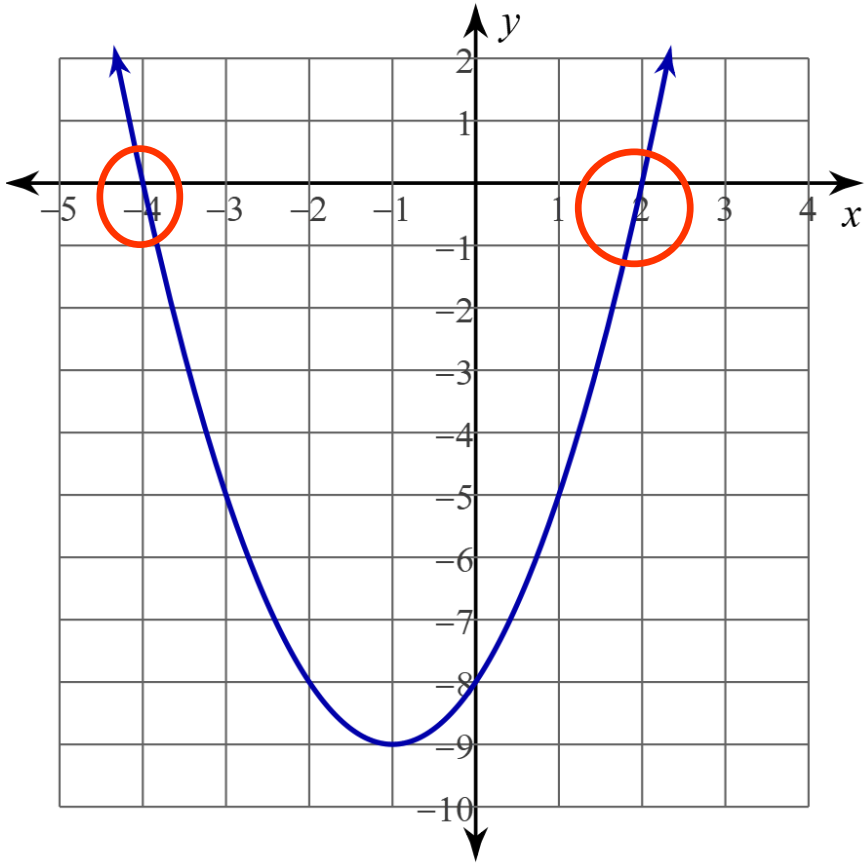
$$0 = A * B$$

Zero Product Property: either

(x + 4) = 0 or (x – 2) = 0

x + 4 = 0 x – 2 = 0

x = -4 x = +2



Intercept form Quadratic Equation

$$y = (x - 1)(x - 3)$$

The y-value of an x-intercept always equals Zero

$$0 = (x - 1)(x - 3)$$

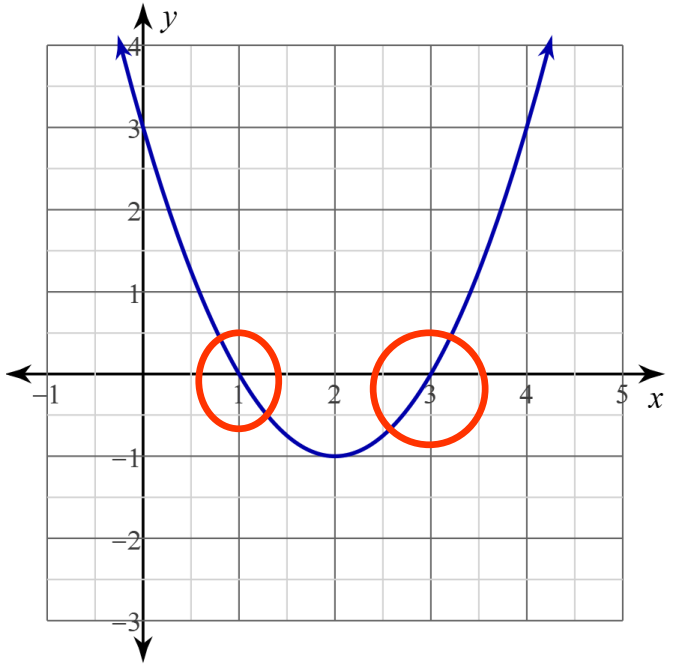
$$0 = A * B$$

Zero Product Property: either

(x – 1) = 0 or (x – 3) = 0

x – 1 = 0 x – 3 = 0

x = 1 x = 3



Standard Form Quadratic Equation is converted to an

Intercept Form Quadratic Equation by factoring.

$y = x^2 + 10x + 21 \rightarrow y = (x + 7)(x + 3)$

x = -7 x = -3

$y = x^2 - 6x - 16 \rightarrow y = (x - 8)(x + 2)$

x = 8 x = -2

$y = x^2 - 9x + 18 \rightarrow y = (x - 6)(x - 3)$

x = 6 x = 3

What are the x-intercepts for each of these equations?

Convert the following Standard Form Quadratic Equations to Intercept Form (by factoring)

$y = x^2 + 3x - 10 \rightarrow y = (x + 5)(x - 2)$

x = -5 x = 2

$y = x^2 - 8x - 20 \rightarrow y = (x - 10)(x + 2)$

x = 10 x = -2

$y = x^2 - 11x + 30 \rightarrow y = (x - 6)(x - 5)$

x = 6 x = 5

What are the x-intercepts for each of these equations?

Intercept Form Quadratic Equation:

Vertical Stretch Factor!

'x-intercepts are 'p' and 'q'

$$y = (-1)a(x - p)(x - q)$$

If negative: reflected across x-axis.

'x-intercepts are: '1' and '3'

$$y = -3(x + 2)(x + 4)$$

$$y = (x - 1)(x - 3)$$

Opens down

'x-intercepts are: '-2' and '-4'

Each set of parentheses is called a "factor". Why?

Convert to Intercept Form

$$y = 2x^2 + 6x + 4$$

Always factor out the common factor first.

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

Now factor the trinomial.

$$y = 2(x + 2)(x + 1)$$

What are the x-intercepts?

'x-intercepts are: '-2' and '-1'

Which way (up/down) does the parabola open?

Up (not reflected across x-axis)

What is the vertical stretch factor?

VSF = 2

Convert to Intercept Form

$$y = 3x^2 - 15x - 18$$

Always factor out the common factor first.

$$y = 3(x^2 - 5x - 6)$$

Now factor the trinomial.

$$y = 3(x - 6)(x + 1)$$

What are the x-intercepts?

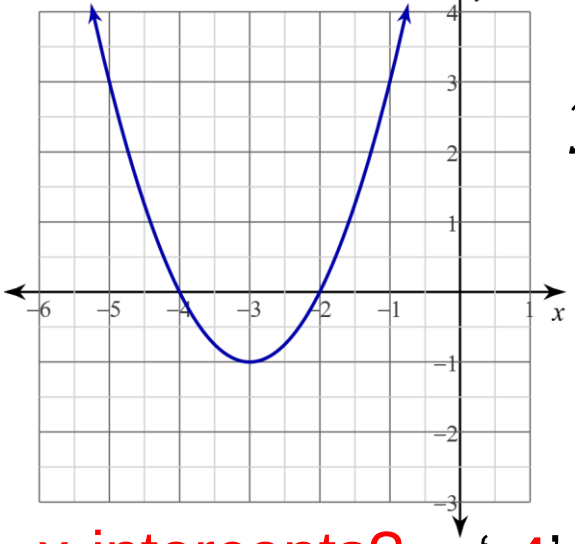
'x-intercepts are: '6' and '-1'

Which way (up/down) does the parabola open?

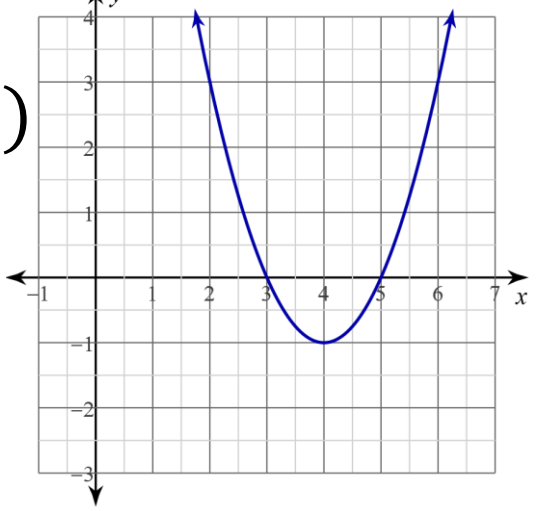
Up (not reflected across x-axis)

What is the vertical stretch factor?

VSF = 3



$$y = (-1)a(x - p)(x - q)$$



x-intercepts? '-4' and '-2'

x-intercepts? '3' and '5'

How can you use the *x-intercepts* to determine the *x-coordinate* of the vertex?

The *x-coordinate* of the vertex is *halfway* between the x-intercepts

x-coordinate of the vertex?

(-3, ___)

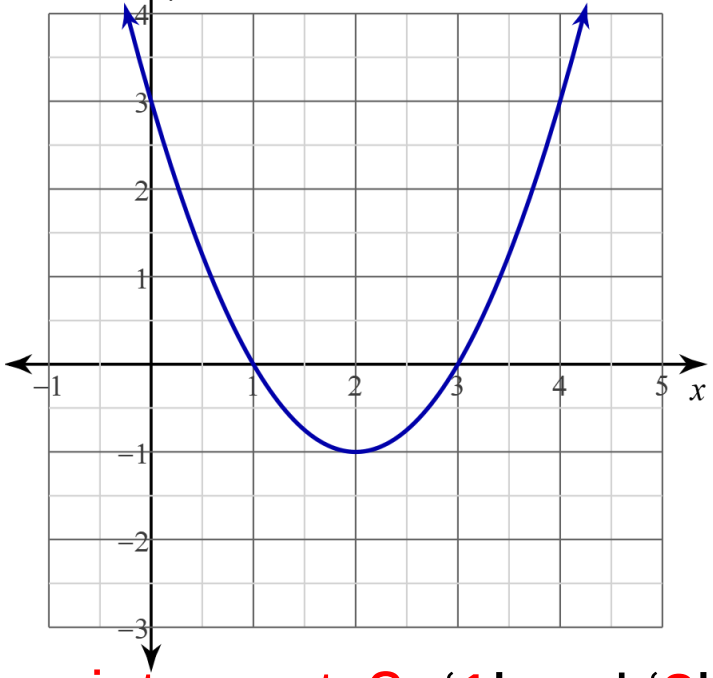
x-coordinate of the vertex?

(4, ___)

What is the equation that has been graphed (in *intercept form*)?

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

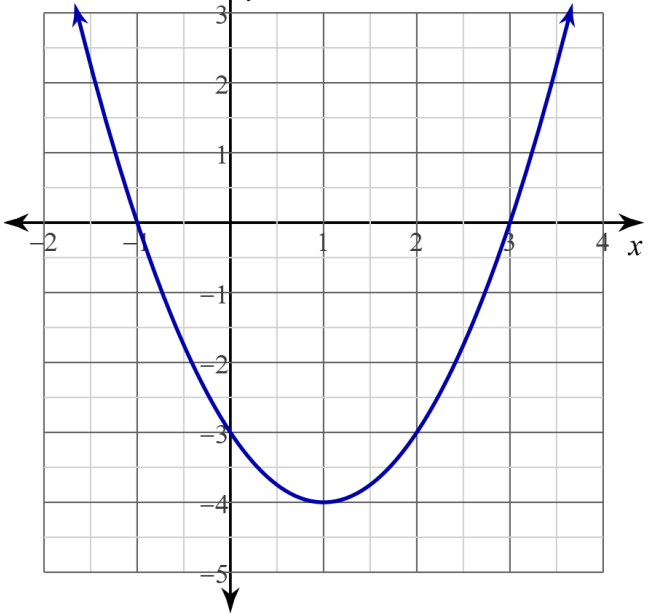
$y = (x - 3)(x - 5)$



x-intercepts? ‘1’ and ‘3’

x-coordinate of the vertex?

(2, ___)



x-intercepts? ‘-1’ and ‘3’

x-coordinate of the vertex?

(1, ___)

What is the Intercept form equation of the parabola?

$y = (x - 1)(x - 3)$

$y = (x + 1)(x - 3)$

Half-way between two numbers is the average of the two numbers. The x-coordinate of the vertex is exactly half-way between the two x-intercepts.

$f(x) = (x+5)(x-1)$

x = -5 x = 1

$x = \frac{-5+1}{2} = \frac{-4}{2}$ = -2

What are the x-intercepts?

What is the x-coordinate of the vertex? (-2, ___)

What is the y-coordinate of the vertex? f(-2)= ?

$f(-2) = (-2+5)(-2-1) = (3)(-3)$

f(-2)= -9

What is the vertical coefficient? $y = a(x-p)(x-q)$

a = 1

What is the vertex form equation? $y = a(x-h)^2 + k$

$y = (x+2)^2 - 9$

$$f(x) = 2(x-6)(x-4)$$

What are the x-intercepts? x = 6 x = 4

What is the x-coordinate of the vertex? $x = \frac{6+4}{2} = \frac{10}{2} = 5$

(5, ___)

What is the y-coordinate of the vertex? f(5) = ?

$f(5) = 2(5-6)(5-4)$ f(5) = 2(-1)(1) f(5) = -2

Vertex: (5, -2)

What is the coefficient? a = 2

What is the vertex form equation? $y = a(x-h)^2 + k$

$$y = 2(x-5)^2 - 2$$

What is the vertex?

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

x = -2 x = 4

$x = \frac{-2 + 4}{2} = \frac{2}{2} = 1$

(1, ____)

$y = 2(1 + 2)(1 - 4)$

$y = 2(3)(-3)$

$y = -18$

(1, -18)

What is the vertex form equation?

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

$y = 2(x - 1)^2 - 18$

What is the standard form equation?

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

(Distributive Property)

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

	x	-4
2x	$2x^2$	-8x
4	4x	-16

$y = ax^2 + bx + c$

$y = 2x^2 - 4x - 16$

What is the vertex form equation?

$$y = 3(x+1)(x-5)$$

x = -1 x = 5

$$x = \frac{-1+5}{2} \qquad = \frac{4}{2} \qquad = 2$$

(2, ___) (2, -27)

$$y = 3(2+1)(2-5) \qquad y = 3(3)(-3) \qquad y = -27$$

$$y = 3(x-2)^2 - 27$$

What is the standard form equation?

$$y = 3(x+1)(x-5)$$

(Distributive Property)

$$y = (3x+3)(x-5)$$

	x	-5
3x	$3x^2$	-15x
3	3x	-15

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

$$y = 3x^2 - 12x - 15$$

What is the vertex form equation?

$$y = (x - 8)(x - 2)$$

x = 8 x = 2

$$x = \frac{8 + 2}{2} = \frac{12}{2} = 5$$

(5, ___) (5, -9)

$$y = (5 - 8)(5 - 2) \qquad y = (-3)(3) \qquad y = -9$$

$$y = (x - 5)^2 - 9$$

What is the standard form equation?

$$y = (x - 8)(x - 2)$$

	x	-2
x	x^2	-2x
-8	-8x	16

$$y = ax^2 + bx + c \qquad y = x^2 - 10x + 16$$

What is the intercept form equation? $y = -3x^2 + 6x + 72$

Common factor? $y = -3(x^2 - 2x - 24)$

Factor trinomial? $y = -3(x - 6)(x + 4)$

What are the x-intercepts? x = 6 x = -4

(6, 0) (-4, 0)

What is the vertex form equation? $x = \frac{6 - 4}{2} = \frac{2}{2} = 1$

(1, ____) (1, 75)

$y = -3(1 - 6)(1 + 4)$ $y = -3(-5)(5)$ $y = 75$

$y = -3(x - 1)^2 + 75$