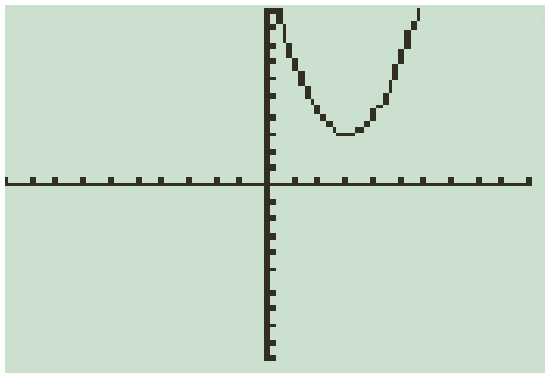


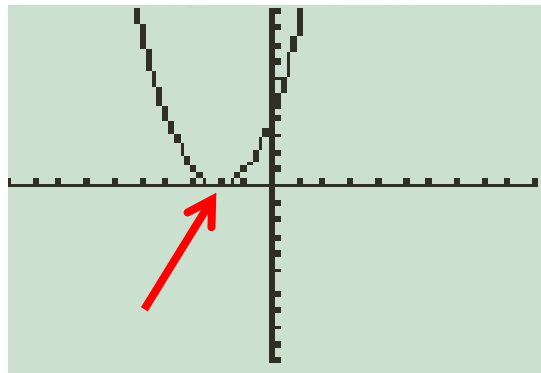
Writing an Equation from Zeros/Factors

The zeros (solutions, roots) of a quadratic are where the graph crosses the x-axis.

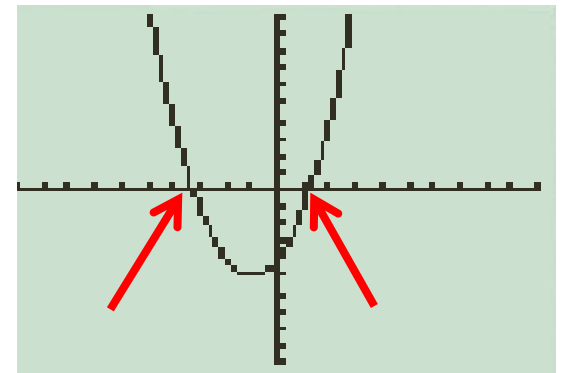
No zeros:



1 zero:



2 zeros:



The factors of a quadratic are what goes inside the parenthesis.

Example) $(x + 2)(x - 3) = 0$ ← factors

$x = -2$ and $x = 3$ ← zeros

What is the equation of the quadratic whose zeros are $x = -4$ and $x = 2$?

$$x = -4 \quad \text{and} \quad x = 2$$

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

Turn the zeros into factors

$$x^2 - 2x + 4x - 8$$

FOIL

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

Write the solution as an equation

What is the equation of the quadratic whose zeros are $x = 0$ and $x = 2.5$?

$$x = 0 \quad \text{and} \quad x = 2.5$$

$$(x + 0)(2x - 5)$$

Turn the zeros into factors

$$x(2x - 5)$$

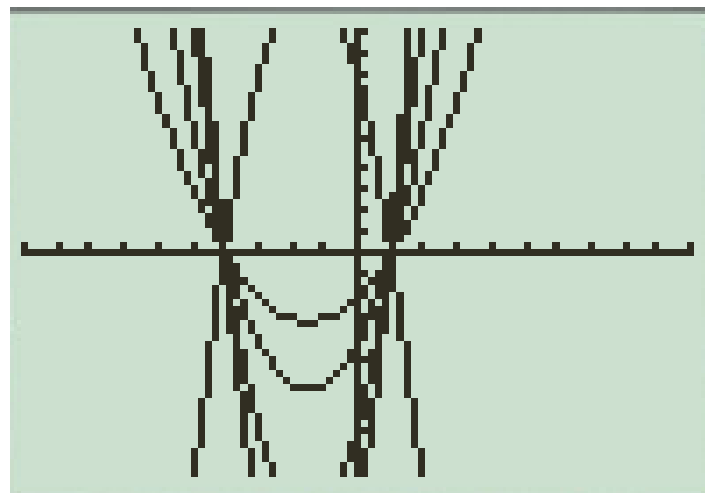
Distribute

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

Write the solution as an equation

When you only know the zeros of a quadratic, you solution is just one possible solution.

```
Plot1 Plot2 Plot3
\Y1 = X^2 + 3X - 4
\Y2 = 2X^2 + 6X - 8
\Y3 = 3X^2 + 9X - 12
\Y4 = -2X^2 - 6X + 8
\Y5 = .5X^2 + 1.5X - 2
\Y6 =
\Y7 =
```



All of these equations have the same zeros. The difference is the value of a : $y = a(x + 4)(x - 1)$

If you know one other point on the graph, then you can get the exact solution.

Example) What is the equation for the graph whose zeros are $x = -4/3$ and $x = -1$ and goes through the point $(-2, 4)$?

$$x = -4/3 \quad \text{and} \quad x = -1$$

$$(3x + 4)(x + 1)$$

$$y = a(3x + 4)(x + 1)$$

$$4 = a(3(-2) + 4)(-2 + 1)$$

$$4 = a(-6 + 4)(-2 + 1)$$

$$4 = a(-2)(-1)$$

$$4 = 2a$$

$$2 = a$$

Turn the zeros into factors

Write as an equation with a.

Substitute (x, y) from the point.

Solve for a: multiply $3(-2)$

Solve for a: simplify parenthesis

Solve for a: multiply parenthesis

Solve for a: divide

$$y = 2(3x + 4)(x + 1)$$

Re-write equation using a.

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

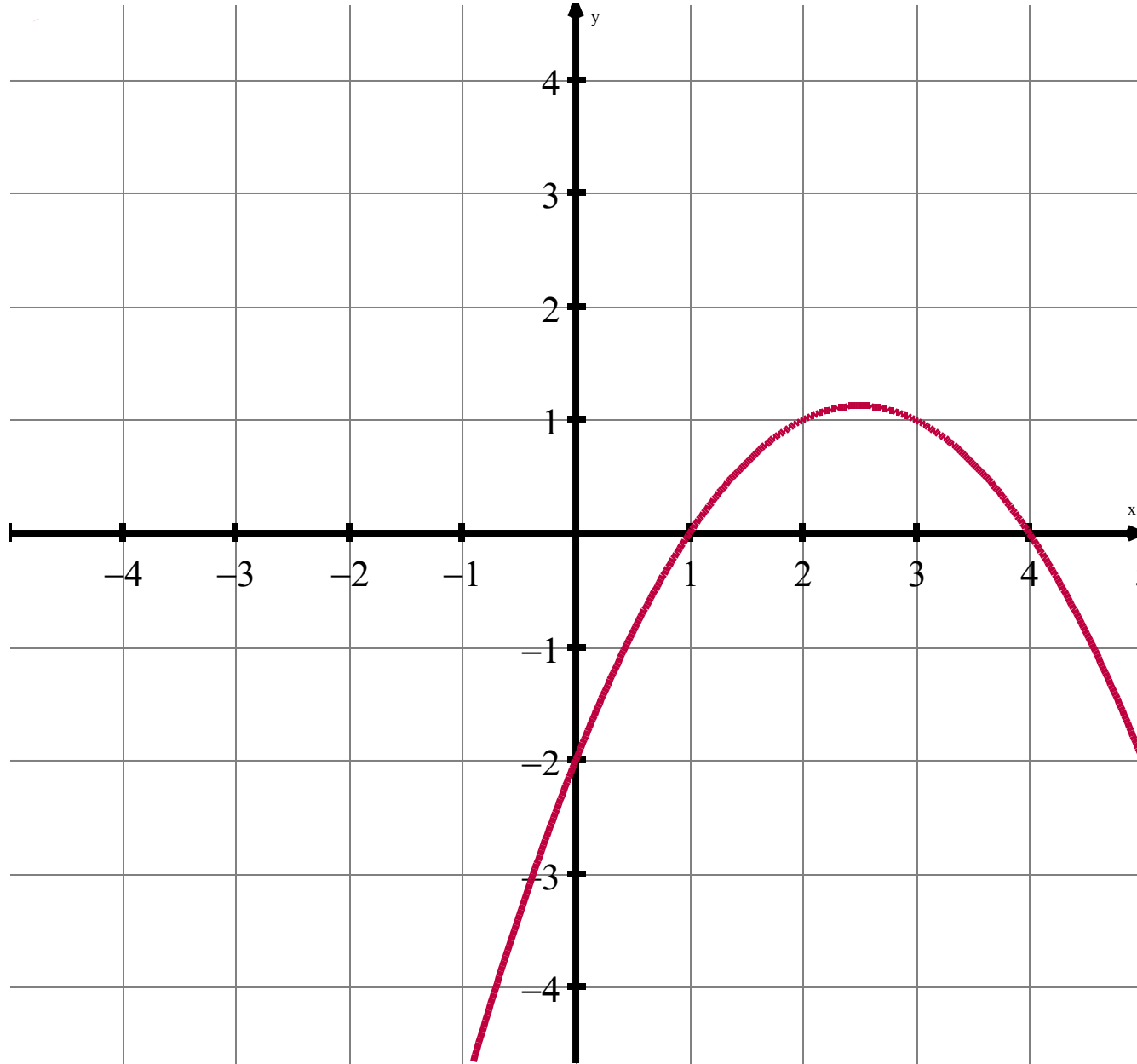
FOIL

$$y = 2(3x^2 + 7x + 4)$$

$$y = 6x^2 + 14x + 8$$

Distribute

Write the equation for the following graph.



$$x = 1 \quad \text{and} \quad x = 4$$

$$(x - 1)(x - 4)$$

$$y = a(x - 1)(x - 4)$$

$$-2 = a(0 - 1)(0 - 4)$$

$$-2 = a(-1)(-4)$$

$$-2 = 4a$$

$$-.5 = a$$

$$y = -.5(x - 1)(x - 4)$$

$$y = -.5(x^2 - x - 4x + 4)$$

$$y = -.5(x^2 - 5x + 4)$$

$$y = -.5x^2 + 2.5x - 2$$

Find the zeros

Turn the zeros into factors

Write as an equation with a.

Substitute (x, y) from another point.
The y-intercept is (0, -2)

Solve for a: simplify parenthesis

Solve for a: multiply parenthesis

Solve for a: divide

Re-write equation using a.

FOIL

Distribute

Determine the equation of the quadratic whose vertex is $(2, 18)$ and one x-intercept is $x = 5$.

$$x = 5 \quad \text{and} \quad x = -1$$

Find the zeros: the vertex will be in the middle of the zeros.

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

Turn the zeros into factors

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

Write as an equation with a.

$$18 = a(2 - 5)(2 + 1)$$

Substitute (x, y) from another point.
The y-intercept is $(0, -2)$

$$18 = a(-3)(3)$$

Solve for a: simplify parenthesis

$$18 = -9a$$

Solve for a: multiply parenthesis

$$-2 = a$$

Solve for a: divide

$$y = -2(x - 5)(x + 1)$$

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

$$y = -2(x^2 - 4x - 5)$$

$$y = -2x^2 + 8x + 10$$

Re-write equation using a.

FOIL

Distribute