

## What's Going On?

**Checking In**

Weekend Assignment

**Minds on**

What's my Inverse?

**Action!**

Determining the Inverse of a  
Quadratic Function

**Consolidation**

You Try!

**Learning Goal - I will be able to determine the inverse of a quadratic function given its graph or equation.**

You know what '+ 16'...

$$y = x^2 + 8x + 12$$

What's that  $(x + 4)^2$ ?

$$y = x^2 + 8x + 16 - 16 + 12$$

You Complete Me  $\times 3$

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

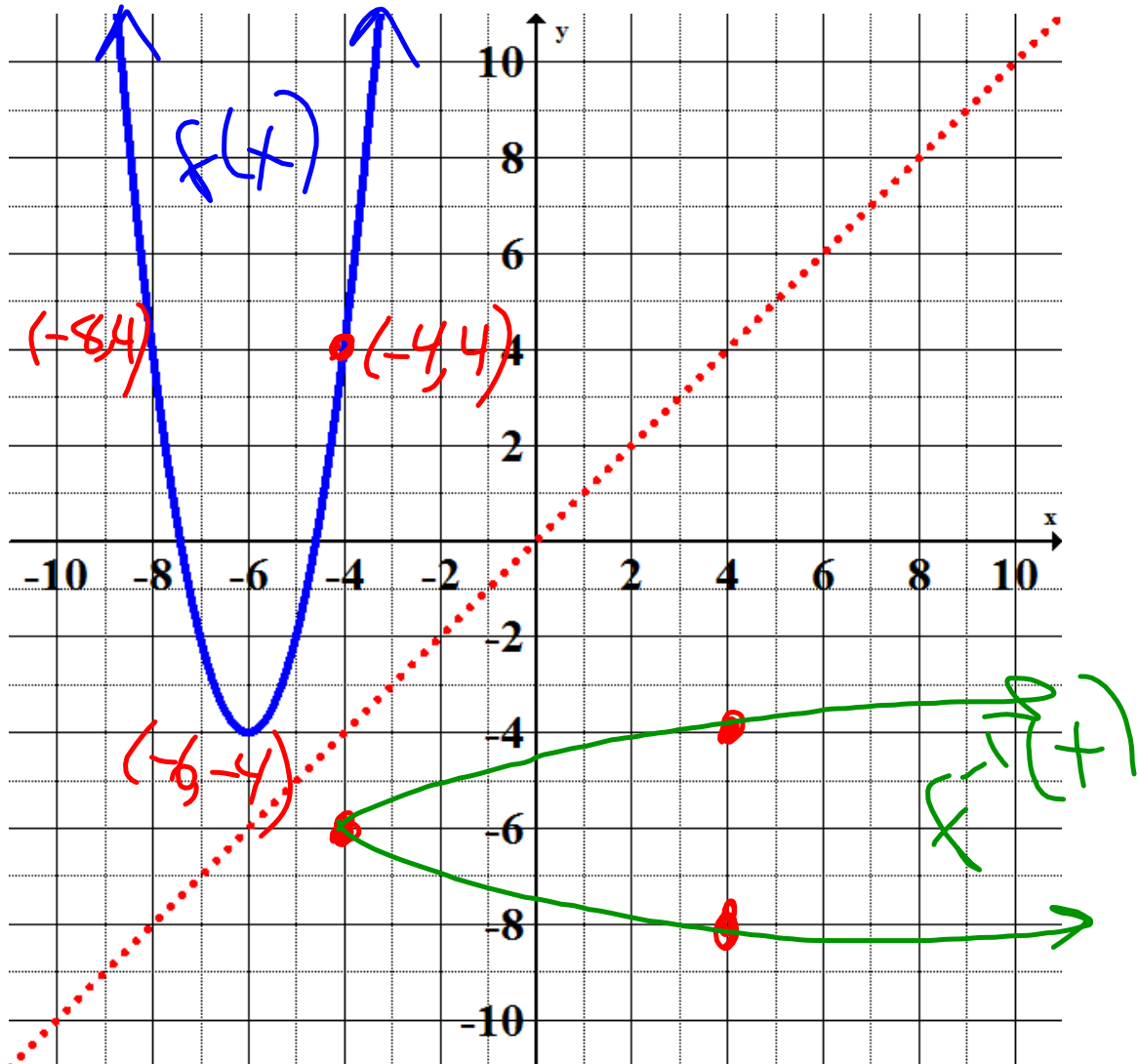
Pfff! What a square...

 **Checking In**

# Weekend Assignment

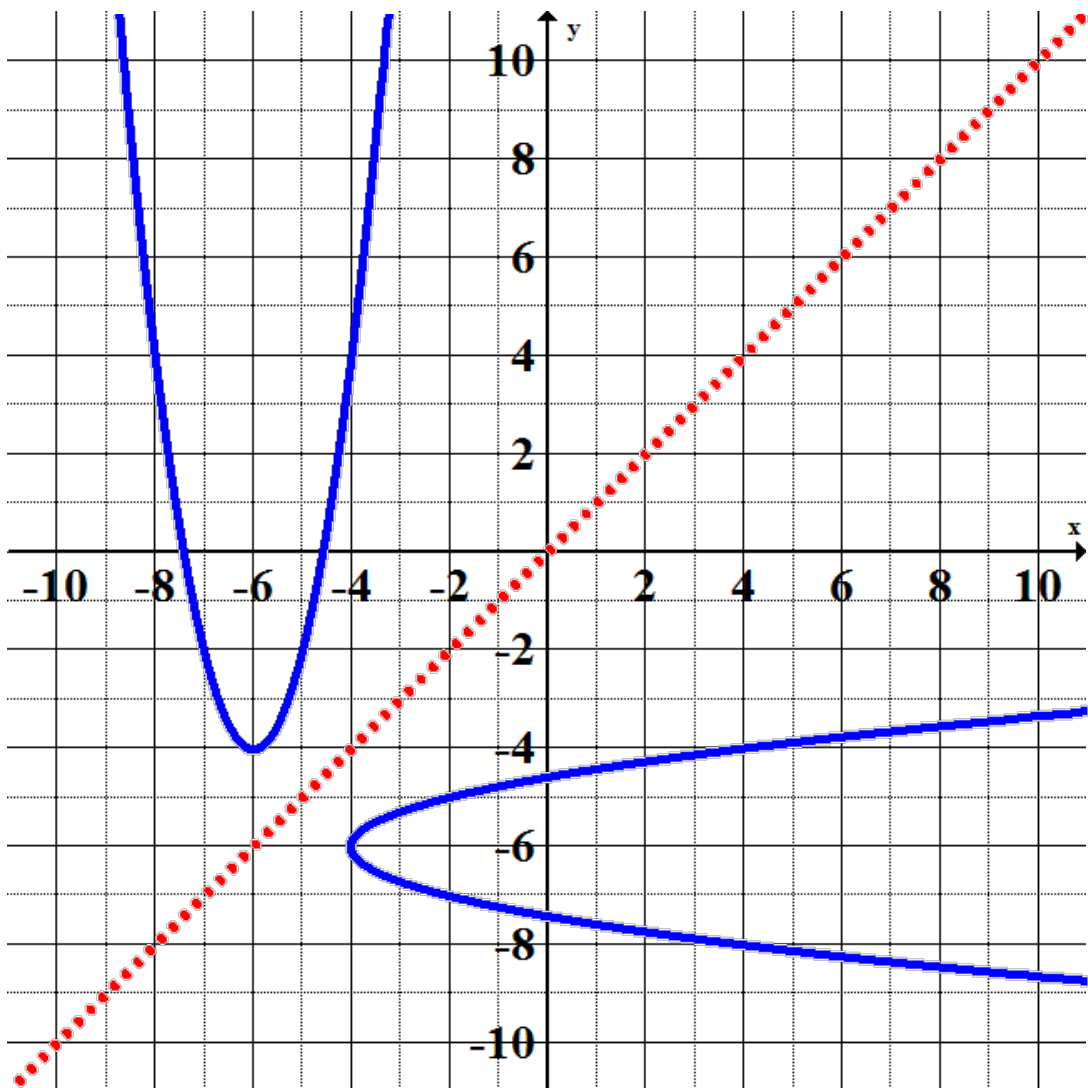
Minds on

# Sketch my Inverse



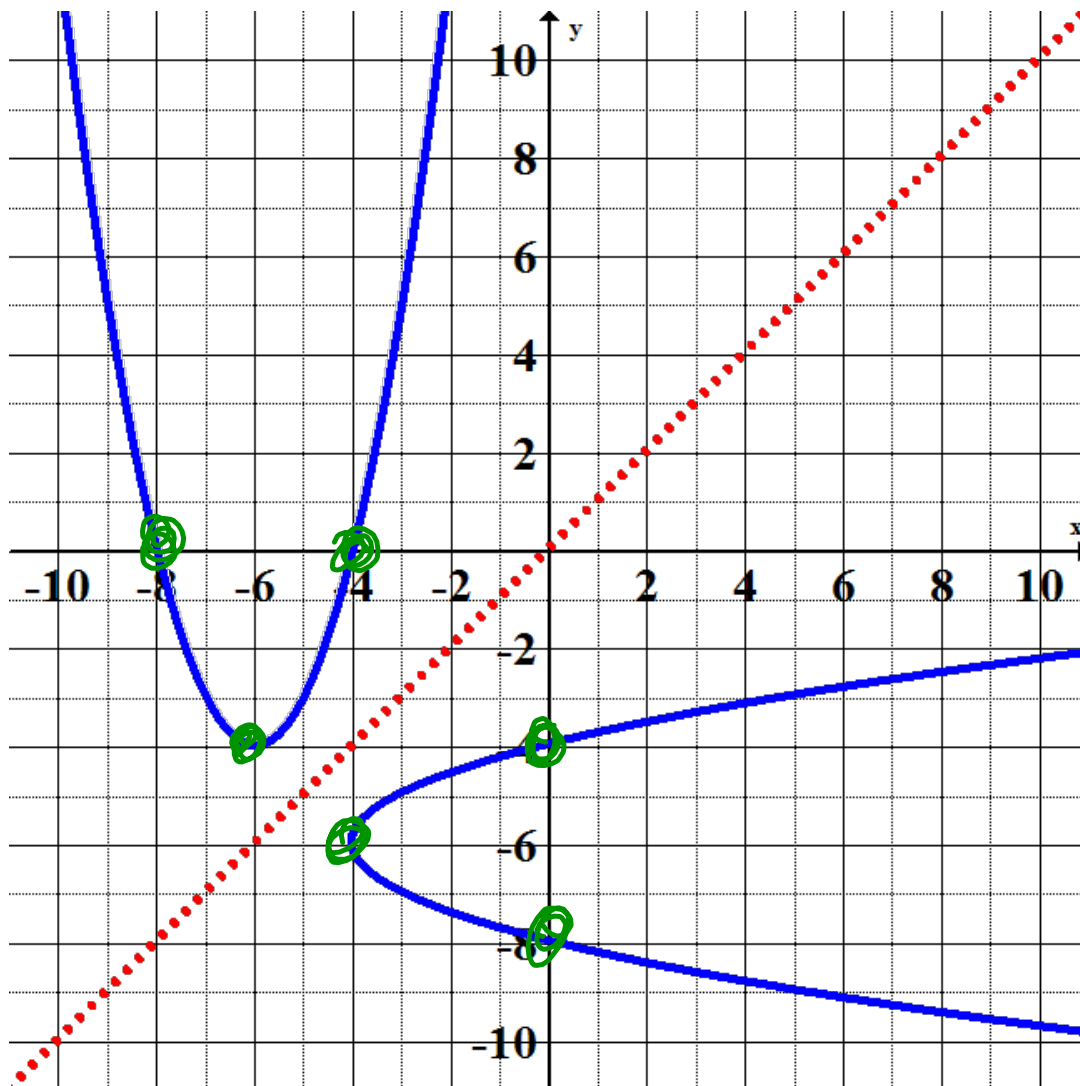
**Minds on**

# Sketch my Inverse



Minds on

# Sketch my Inverse



Look at the vertices

It went from  $(-6, -4)$  to  $(-4, -6)$

Look at the intercepts

The x-intercepts became the y-intercepts

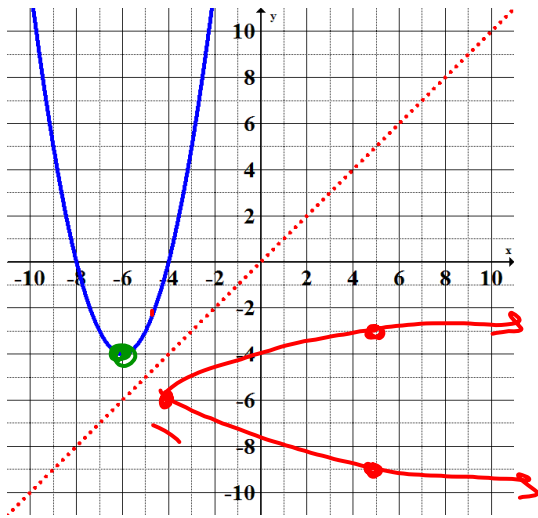
## Action!

### Determining the Inverse of a Quadratic Function

<p>The steps for determining inverses of other functions are the same as with a linear function (discussed in chapter 1):</p> <p><b>Step 1:</b> Write the equation as "y =" instead of "f(x) ="</p> <p><b>Step 2:</b> Interchange the x and y variables to get the equation of the inverse function</p> <p><b>Step 3:</b> Solve for y in the equation from step 2 *don't forget to use BEDMAS in reverse → SAMDEB</p> <p><b>Step 4:</b> Rewrite the equation using the <math>f^{-1}</math> notation</p>	<p><u>Example:</u> <math>f(x) = 5x - 3</math></p> <p>↪ <math>y = 5x - 3</math></p> <p>The inverse function <math>f^{-1}</math> is given by</p> <p><math>x = 5y - 3</math></p> <p>solve for y <math>5y - 3 = x</math></p> <p><math>5y = x + 3</math></p> <p><math>y = \frac{x + 3}{5}</math></p> <p>* <u><math>f^{-1}(x) = \frac{x + 3}{5}</math></u></p>
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**Action!**

Determining the Inverse of a Quadratic Function



What's the equation?

vertex =  $(-6, -4)$

$a = 1$

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

$y = (x+6)^2 - 4$

$x = (y+6)^2 - 4$

Solve for y

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

sqrt both sides  $\pm \sqrt{x+4} = \pm \sqrt{(y+6)^2}$

$y + 6 = \pm \sqrt{x+4}$

$y = \pm \sqrt{x+4} - 6$

$f^{-1}(x) = \pm \sqrt{x+4} - 6$

This is  $\sqrt{x}$  (parent function)

shifted left 4, down 6



$$f^{-1}(x) = \pm \sqrt{x+4} - 6$$

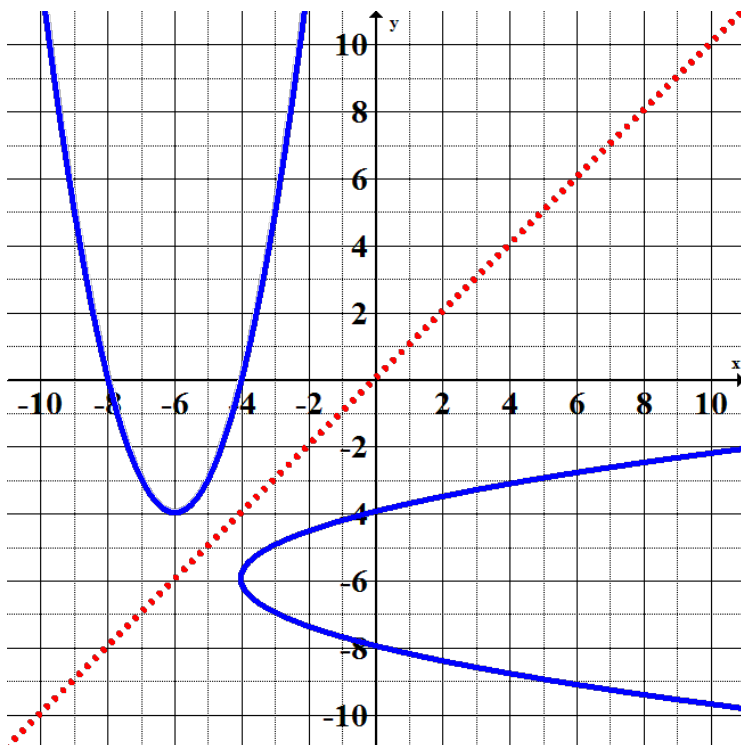
When  $x=5$

$$\begin{aligned} f^{-1}(5) &= \pm \sqrt{5+4} - 6 \\ &= \pm \sqrt{9} - 6 \\ &= \pm 3 - 6 \end{aligned}$$

$$\begin{aligned} +3 - 6 & \text{ and } -3 - 6 \\ = -3 & \qquad \qquad = -9 \end{aligned}$$

## Action!

### Determining the Inverse of a Quadratic Function



What's the equation of the inverse?

$$f^{-1}(x) = \pm \sqrt{x+4} - 6$$

This is a square root function with a vertex at (-4, -6)

Notice the +/-

Consolidation

# You Try!

**Example 1:** Given the quadratic function  $f(x) = -3(x + 7)^2 + 8$

- a) Graph  $f(x)$  and its inverse ✓
- b) Determine whether the inverse of  $f(x)$  is also a function **NO**
- c) Determine the equation of the inverse
- d) State the domain and range of  $f(x)$  and the inverse relation

$$f(x) = -3(x+7)^2 + 8$$

$$y = -3(x+7)^2 + 8$$

$$x = -3(y+7)^2 + 8$$

$$\frac{x-8}{-3} = \frac{-3(y+7)^2}{-3}$$

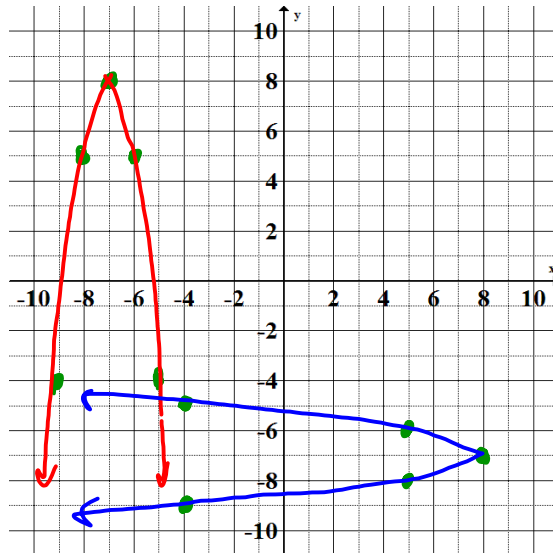
$$\sqrt{\frac{-x+8}{3}} = \sqrt{(y+7)^2}$$

$$y+7 = \sqrt{-\frac{1}{3}(x-8)} - 7$$

$$y = \pm \sqrt{-\frac{1}{3}(x-8)} - 7$$

$$f^{-1}(x) = \pm \sqrt{-\frac{1}{3}(x-8)} - 7$$

$$\left. \begin{array}{l} \text{Domain} = \{x \in \mathbb{R} \mid x \leq 8\} \\ \text{Range} = \{y \in \mathbb{R}\} \end{array} \right\} f^{-1}(x)$$



**Consolidation**

# Homework

**Pg. 161**

**1 - 4, 7, 8, 10, 13**