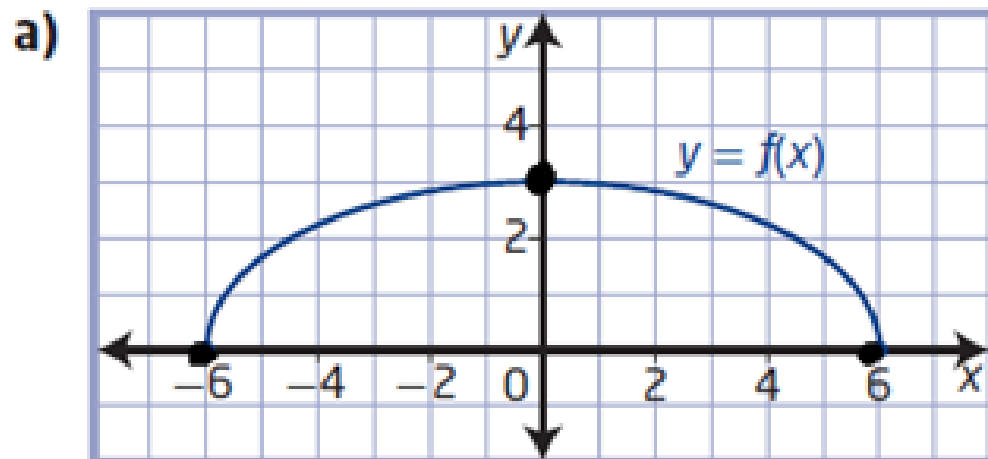


5. For each graph of  $y = f(x)$ , sketch the graph of the combined transformations. Show each transformation in the sequence.



- vertical stretch about the  $x$ -axis by a factor of 2
- horizontal stretch about the  $y$ -axis by a factor of  $\frac{1}{3}$
- translation of 5 units to the left and 3 units up

V S 2  
 H S  $\frac{1}{3}$   
 T + 3  
 H T - 5

$$(x, y) \rightarrow \left(\frac{1}{3}x - 5, 2y + 3\right)$$

$$\begin{array}{l|l} -6 & 0 \\ 0 & 3 \\ 6 & 0 \end{array} \quad \begin{array}{l|l} -7 & 3 \\ -5 & 9 \\ -3 & 3 \end{array}$$

which one doesn't belong?

9	16
25	43

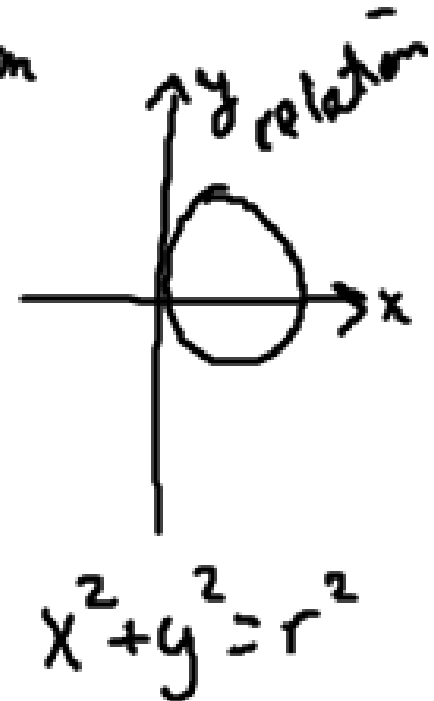
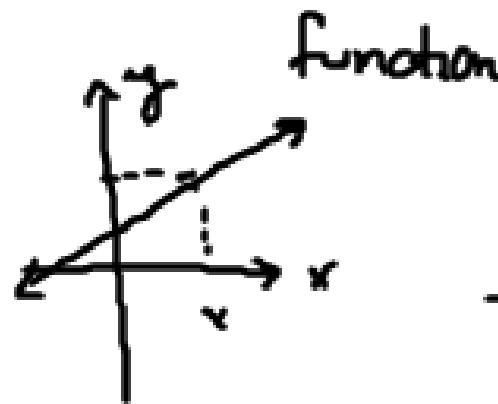
# 1.4

## Inverse of a Relation

### Focus on...

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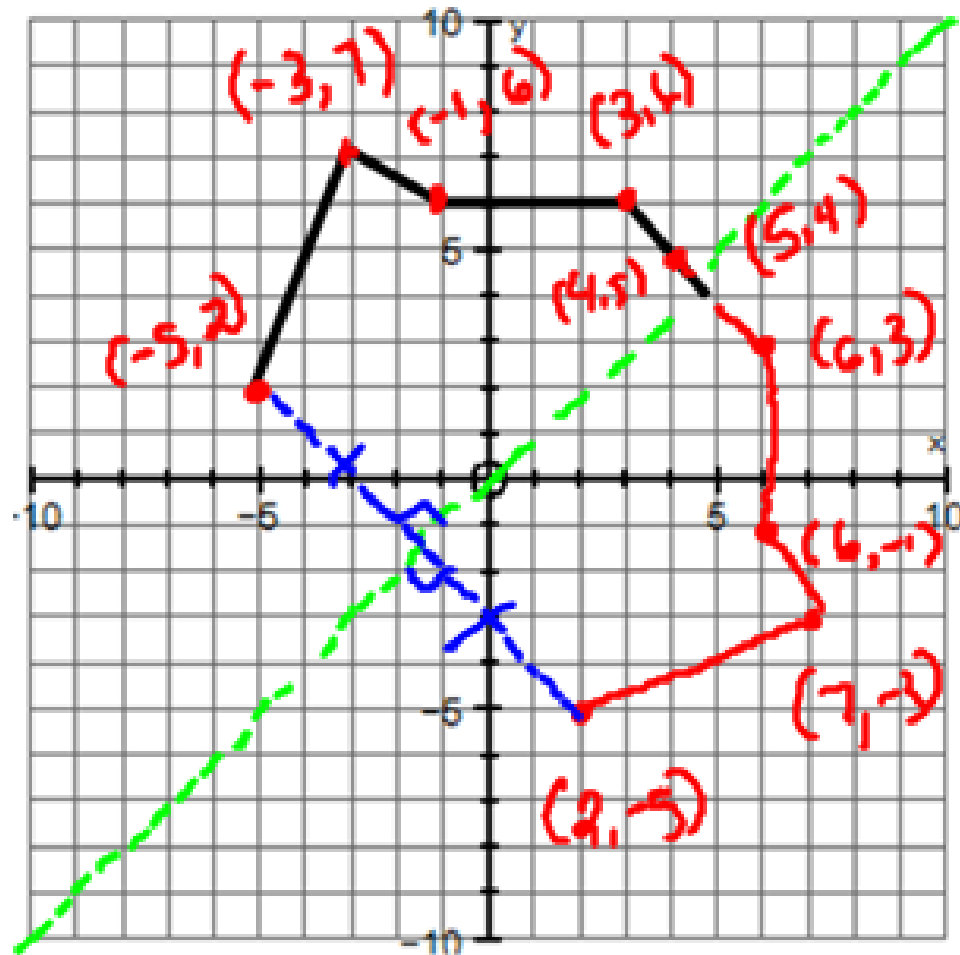
- sketching the graph of the inverse of a relation
- determining if a relation and its inverse are functions
- determining the equation of an inverse



- An inverse function is when the x- and y-coordinates are switched and written as  $y = f^{-1}(x)$ . ← name say "f inverse of x"
- The domain of  $f(x)$  is the range of  $f^{-1}(x)$
- Graphically an inverse is a reflection in the  $y = x$  axis

Our inverse is not a function .. (fails the vertical line test at  $x=6$ )

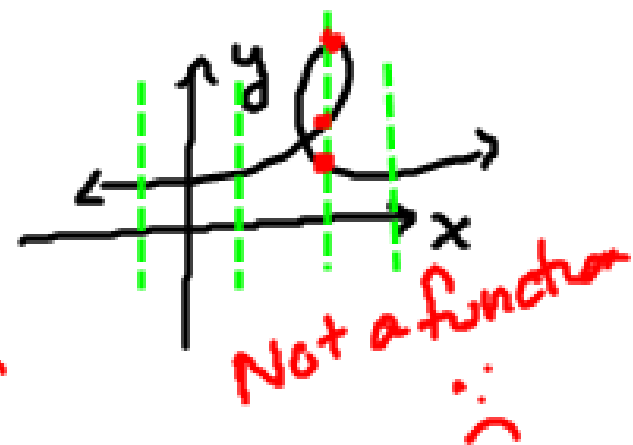
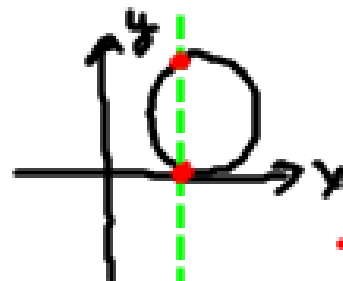
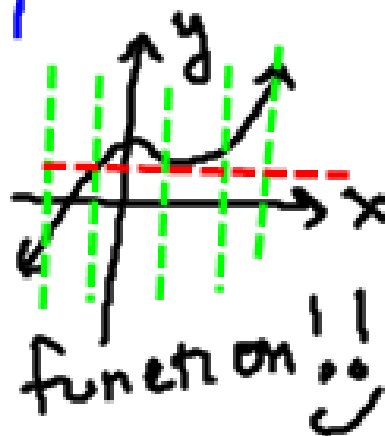
We cannot use  $f^{-1}(x)$  notation



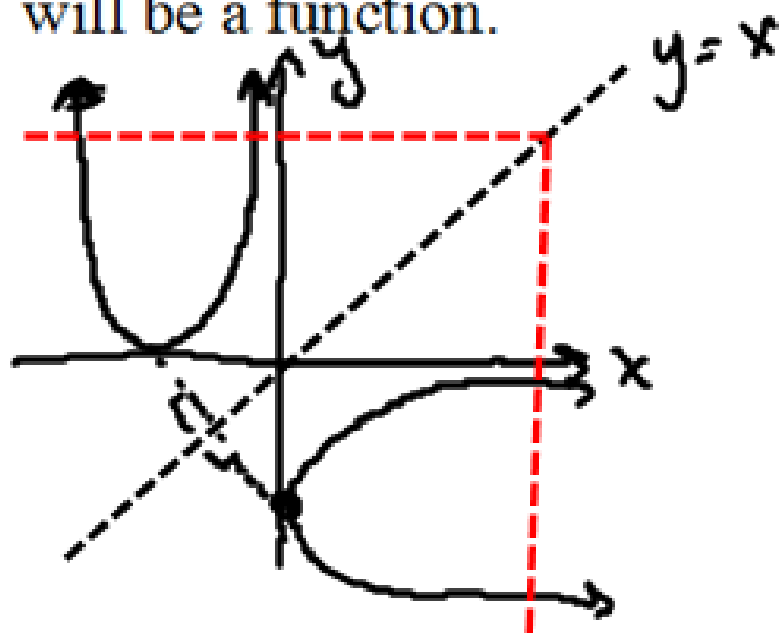
$y = f(x)$	Inverse
<p>Points on the relation:</p> <p><math>(-5, 2)</math> <math>(-3, 7)</math></p> <p>Domain: set: <math>\{x \mid -5 \leq x \leq 5\}</math> interval: <math>x \in [-5, 5]</math></p> <p>Range: <math>\{y \mid 2 \leq y \leq 7\}</math> <math>y \in [2, 7]</math></p>	<p>Points on the inverse relation:</p> <p><math>(2, -5)</math> <math>(7, -3)</math></p> <p>Domain: <math>\{x \mid 2 \leq x \leq 7\}</math></p> <p>Range: <math>\{y \mid -5 \leq y \leq 5\}</math></p>

$5 > x > -5 \leftarrow$  wrong  
 element                      ent

Vertical line test - used to determine if a graph is a function



Horizontal line test - used to determine if the graph of an inverse will be a function.



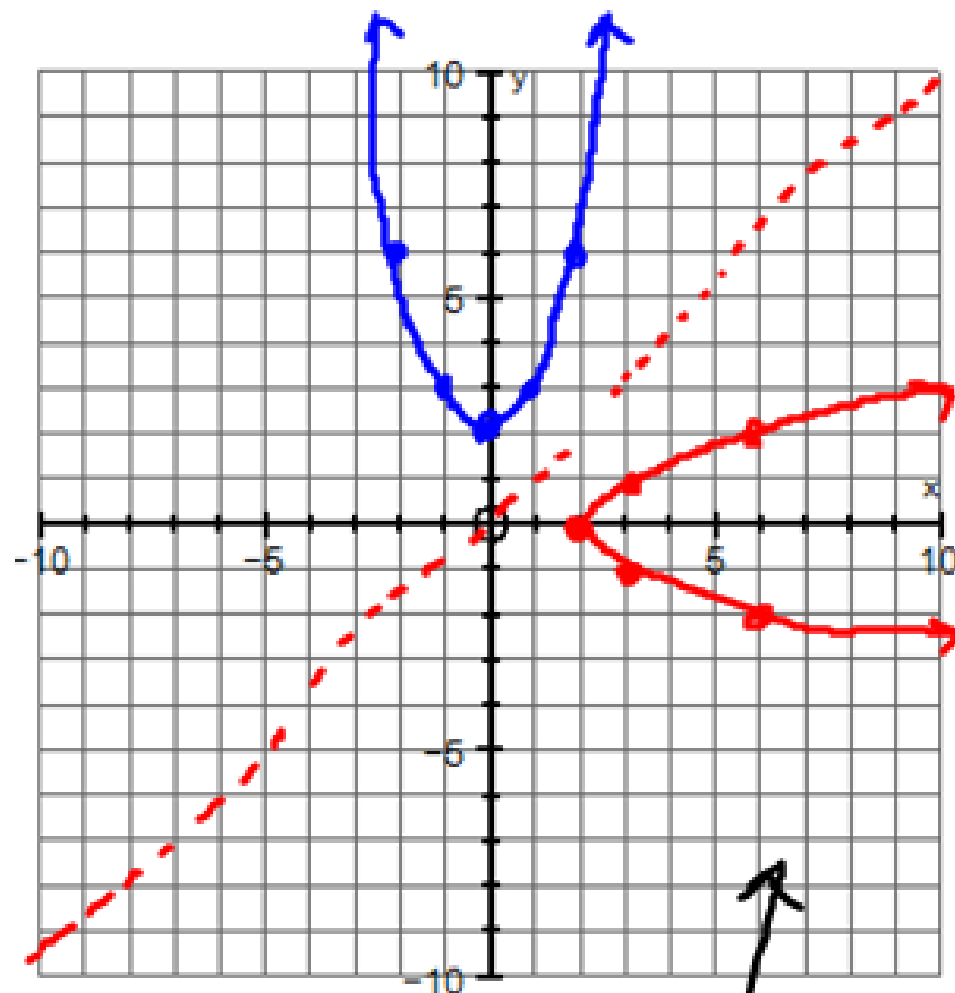
## Restricting the Domain

Graph the following:

$f(x) = x^2 + 2$  and graph its  
inverse on the same graph.

Does the inverse pass the vertical  
line test? **NO**

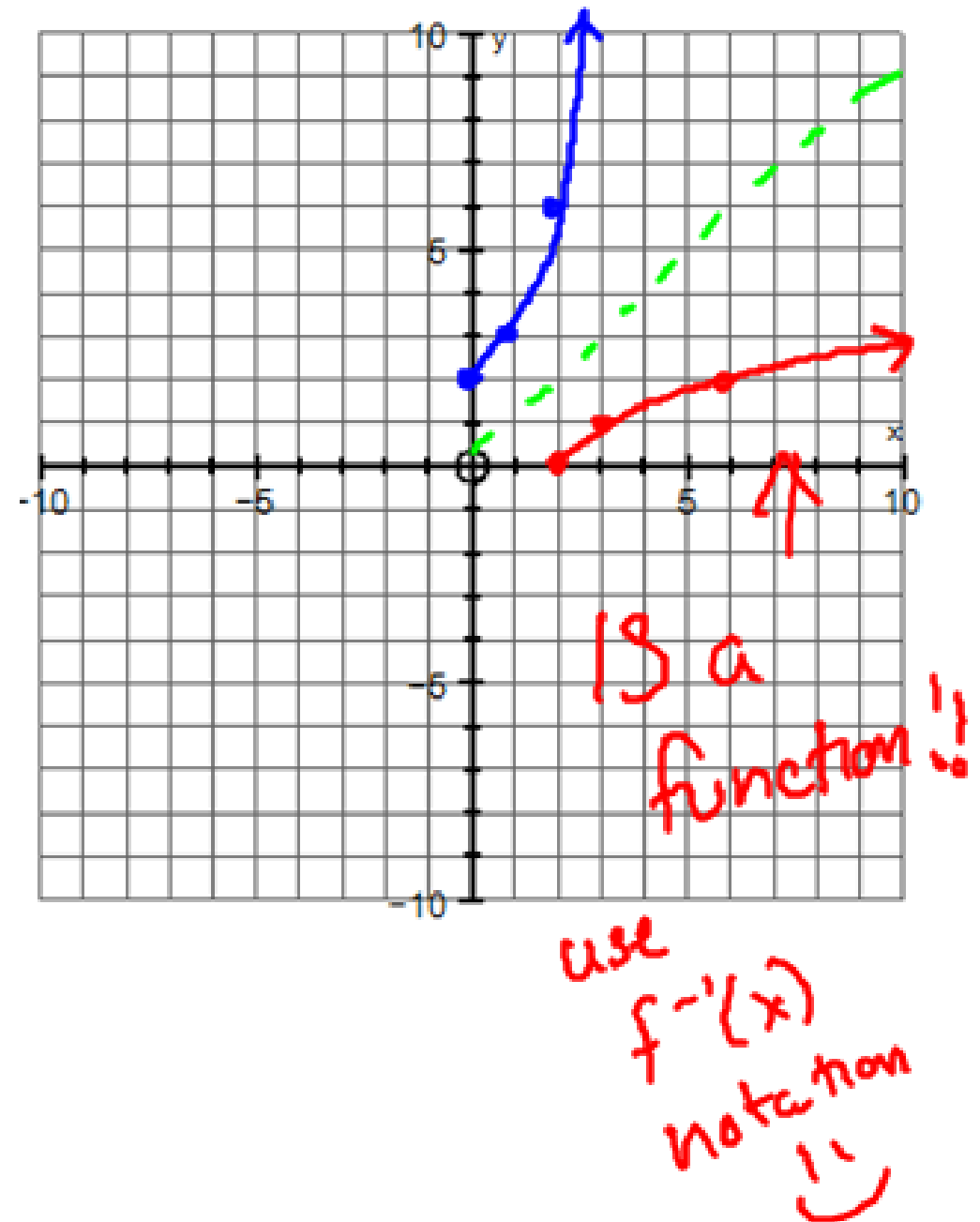
This means the inverse of  $f(x)$  is  
NOT a function. - can't use  
 $f^{-1}(x)$  notation



inverse of  
a function

We can restrict the domain of  $f(x)$  so that we only graph one half of the parabola.

Graph:  $f(x) = x^2 + 2$   
where  $\{x \mid x \geq 0, x \in \mathbb{R}\}$  and  
graph its inverse on the same  
graph.





Determining the equation of an inverse:

Step 1- replace  $f(x)$  with  $y$

Step 2- interchange  $x$  and  $y$

Step 3 – solve for  $y$

Step 4 – check to see if the inverse is a function. If it is, replace  $y$  with  $f^{-1}(x)$

Example: find the inverse of  $f(x) = 4x + 8$   $\leftarrow$  linear

$$\begin{aligned}y &= 4x + 8 \\x &= 4y + 8 \\4y &= x - 8 \\y &= \frac{x - 8}{4} \\y &= \frac{x}{4} - 2\end{aligned}$$

$$\begin{aligned}y &= \frac{1}{4}x - 2 \leftarrow \text{linear} \\ \text{The inverse is a function} \\ f^{-1}(x) &= \frac{1}{4}x - 2\end{aligned}$$

Example: find the inverse of  $g(x) = x^2 - 9$

Quadratic is a function

$$y = x^2 - 9$$

$$x = y^2 - 9$$

$$y^2 = x + 9$$

$$\sqrt{y^2} = \sqrt{x+9}$$

$$y = \pm \sqrt{x+9}$$

$$y = \sqrt{x+9}$$

or

$$y = -\sqrt{x+9}$$

Not a function!  
for one x-value  
there are two  
y values!!  
∴

HW: pg 51  
# 1-6, 8, 9, 14, 20

→ Do not use  
inverse notation

HW: pg 51 #1-6,8,9,14,20

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