

Warm up SAM DEBGiven $f(x) = 3x^2 + 5$, evaluate: $y = 3x^2 + 5$

d) $f^{-1}(80)$

Inverse

$$x = 3y^2 + 5$$

$$x - 5 = 3y^2 + 5 - 5$$

$$\frac{x-5}{3} = \frac{3y^2}{3}$$

$$\frac{x-5}{3} = y^2$$

$$\sqrt{\frac{x-5}{3}} = \sqrt{y^2}$$

$$y = \sqrt{\frac{x-5}{3}}$$

$$f^{-1}(x) = \sqrt{\frac{x-5}{3}}$$

$$f^{-1}(80) = \sqrt{\frac{(80)-5}{3}}$$

$$= \sqrt{\frac{75}{3}}$$

$$= \sqrt{25}$$

$$f^{-1}(80) = 5$$

Do Today

D17

#2 Combining transformation Function Assign #2.docx

Solutions on next sildes

page 51-53 2,3,5,6,8,9,15,16(a,b,c) 17, 21

Review: page 56-57

1,2,3,5,9,10,11,12,13, 14,15,16

page 58-59 1-10

Solutions

1. Suppose (12,5) is the point of the graph of $f(x)$, for each of the following, name the image point

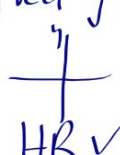
	Mapping Rule	Image Point (12,5)
a. $y = 5f(x + 9) - 6$	$(x, y) \rightarrow (x - 9, 5y - 6)$	(3, 19)
b. $y = f(-3(x - 4)) + 2$	$(x, y) \rightarrow (-\frac{1}{3}x + 4, y + 2)$	(0, 7)
c. $y = -2f(x) + 10$	$(x, y) \rightarrow (x, -2y + 10)$	(12, 0)
d. $y = 4f(2x + 12) - 1$	$(x, y) \rightarrow (\frac{1}{2}x - 6, 4y - 1)$	(0, 19)
e. $y = -3f(\frac{1}{4}(x - 2)) + 9$	$(x, y) \rightarrow (4x + 2, -3y + 9)$	(50, -6)

$$y = 4f(2(x+6)) - 1$$

2. Write the **equation** of the following functions, given the transformations stated.

- a. $y = f(x)$ is vertically stretched by a factor of 6, reflected in the y-axis, translated 7 units to the left and translated 4 units downwards.

VS 6 Horiz Flip 7L 4D $y = 6f(-(x+7)) - 4$

reflect y-axis

 HR ✓

- b. $y = f(x)$ is horizontally stretched by a factor of $\frac{1}{5}$, reflected in both the x-axis and the y-axis, translated 11 units up.

1 flip Horiz. Stretch $\frac{1}{5}$ 11 up Horiz flip $y = -f(-5x) + 11$

VS — HS $\frac{1}{5}$
 VR ✓ HR ✓
 VT +11 HT —

- c. $y = f(x)$ is vertically stretched by a factor of 3, horizontally stretched by a factor of 8 and reflected in the x-axis and translated 9 units right

VS = 3 HS = 8 Vert flip 9R $y = -3f(\frac{1}{8}(x-9))$

VS 3 HS 8
 VR ✓ HR —
 VT — HT R 9

- d. $y = f(x)$ is vertically stretched by a factor of 7, translated 10 units left and 8 units down

VS = 7 10L 8D $y = 7f(x+10) - 8$

VS 7 HS —
 VR — HR —
 VT D 8 HT L 10

3. Given the graph of $f(x)$, sketch the graph of the following functions, and state the domain and range for each:

a. $g(x) = -f(2(x-7))+10$

$$(x, y) \rightarrow (\frac{1}{2}x + 7, -y + 10)$$

-18	16
-14	16
-12	6
-10	16
-6	16

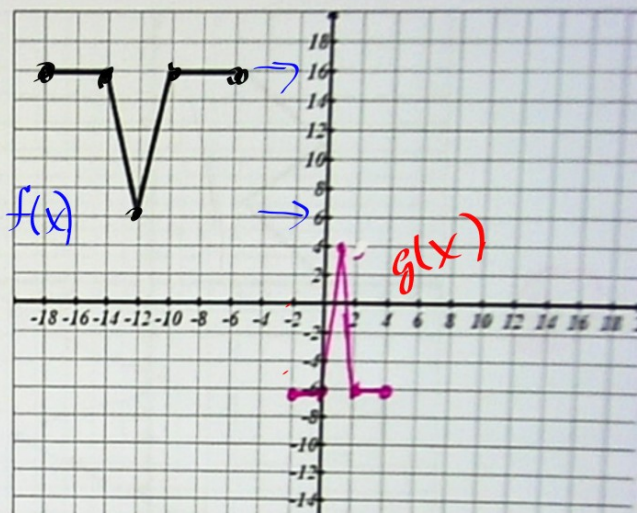
x	y
-2	-6
0	-6
1	4
2	-6
4	-6

Domain $f(x)$ $-18 \leq x \leq -6$

Range $f(x)$ $6 \leq y \leq 16$

Domain $g(x)$ $-2 \leq x \leq 4$

Range $g(x)$ $-6 \leq y \leq 4$



b. $h(x) = 3f(-(x-2)) + 10$

$$(x, y) \rightarrow (-x + 2, 3y + 10)$$

x	y
-10	-3
-8	-6
-4	-6
-6	-3
2	-3

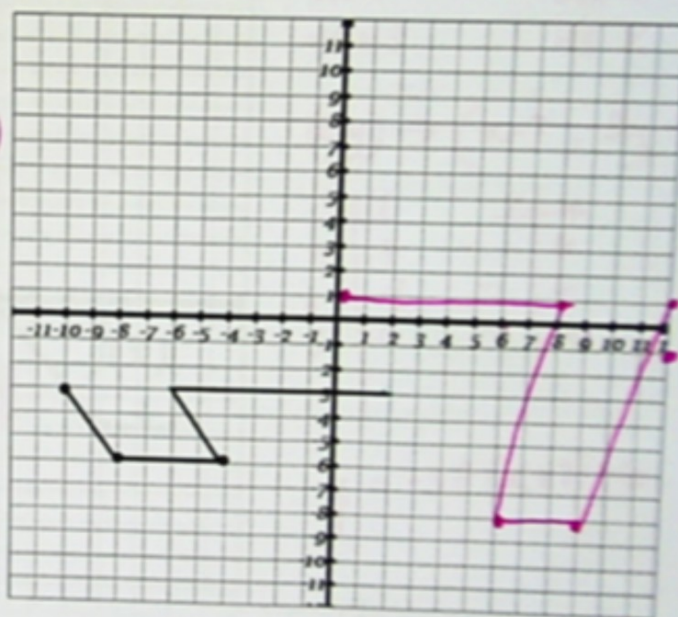
x	y
12	4
10	-8
6	-8
8	1
0	1

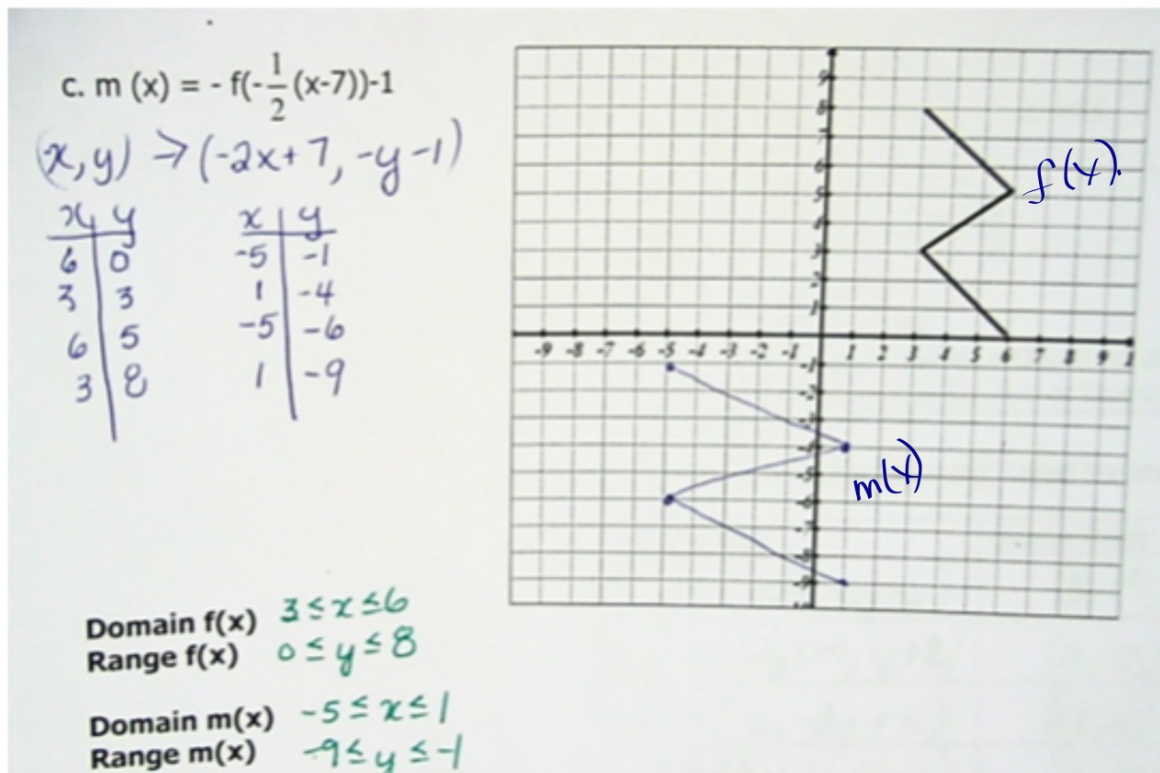
Domain $f(x)$ $-10 \leq x \leq 2$

Range $f(x)$ $-6 \leq y \leq -3$

Domain $h(x)$ $0 \leq x \leq 12$

Range $h(x)$ $-8 \leq y \leq 1$





4. Given the graph of $h(x)$, sketch $h^{-1}(x)$
 State the domain and range of $h^{-1}(x)$
 Are there any invariant points

No

Domain $h^{-1}(x)$
 Range $h^{-1}(x)$

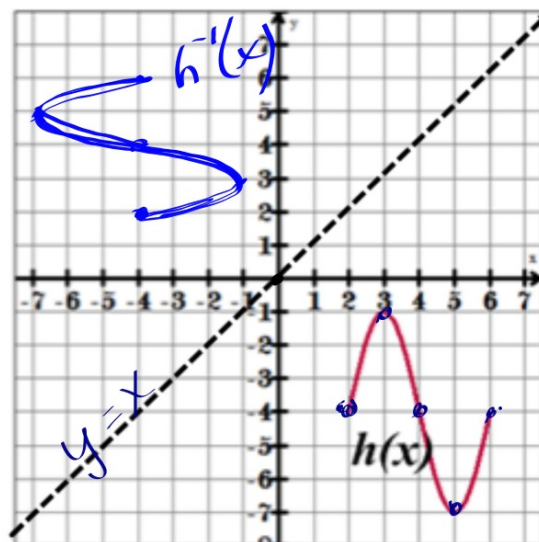
$h(x)$		$h^{-1}(x)$	
x	y	x	y
2	-4	-4	2
3	-1	-1	3
4	-4	-4	4
5	-7	-7	5
6	-4	-4	6

$$D: h^{-1}(x) \quad -7 \leq x \leq -1$$

$$R: h^{-1}(x) \quad 2 \leq y \leq 6$$

Add: Draw in the line of symmetry!
 $y = x$ for inverse functions

NOTE: By the vertical line test the inverse is not a function



5. State The equation of the inverse:

a. $f(x) = 4(x+2)^2$

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

inv:

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

$$\frac{x}{4} = (y+2)^2$$

$$\sqrt{\frac{x}{4}} = y+2$$

$$\sqrt{\frac{x}{4}} - 2 = y$$

$$f^{-1}(x) = \sqrt{\frac{x}{4}} - 2$$

**b. $f(x) = \frac{9x-3}{4x+1}$

$$*b \ y = \frac{9x-3}{4x+1}$$

$$\text{inv: } x = \frac{9y-3}{4y+1}$$

$$x(4y+1) = 9y-3$$

$$4xy+x = 9y-3$$

$$4xy-9y = -x-3$$

$$y(4x-9) = -x-3$$

$$y = \frac{-x-3}{4x-9}$$

$$f^{-1}(x) = \frac{-x-3}{4x-9}$$

c. $y = 5\sqrt{3x+1} + 11$

$$\text{inv: } x = 5\sqrt{3y+1} + 11$$

$$x-11 = 5\sqrt{3y+1}$$

$$\frac{x-11}{5} = \sqrt{3y+1}$$

$$\left(\frac{x-11}{5}\right)^2 = 3y+1$$

$$\left(\frac{x-11}{5}\right)^2 - 1 = 3y$$

$$\frac{\left(\frac{x-11}{5}\right)^2 - 1}{3} = y$$

$$f^{-1}(x) = \frac{\left(\frac{x-11}{5}\right)^2 - 1}{3} \checkmark$$

Reduce $\uparrow$ complex fraction

$$f^{-1}(x) = \frac{\frac{(x-11)^2}{25} - 1}{3 \times 25}$$

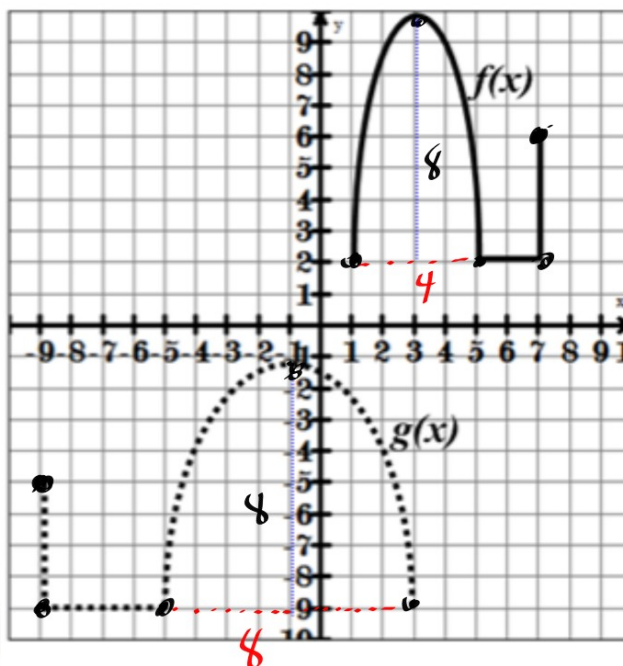
$$f^{-1}(x) = \frac{(x-11)^2 - 25}{75}$$

6. Given $f(x)$ describe the equation of $g(x)$ as a transformation of $f(x)$

VS - HS $\times 2$
 VR - HR $\checkmark$
 VT - HT

$f(x)$		$g(x)$
7	6	9
7	2	-9
5	2	-5
3	10	-1
1	2	3

$y-11$



$$(x, y) \rightarrow (-2x + 5, y - 11)$$

$$g(x) = f\left(-\frac{1}{2}(x - 5)\right) - 11$$

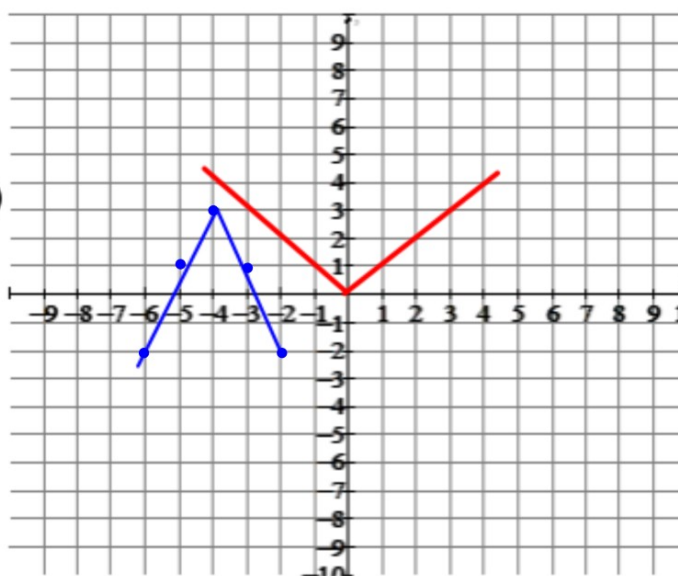
7. Given $y = -2|x + 4| + 3$

$y = |x|$

$(x, y) \rightarrow (x - 4, -2y + 3)$

x	y
-2	2
-1	1
0	0
1	1
2	2

x	y
-6	-1
-5	1
-4	3
-3	1
-2	-1



8. Given the function $y = -3x - 16$, determine the equation of the inverse and determine, if any, invariant points.

$$x = -3y - 16$$

$$x + 16 = -3y$$

$$\frac{x + 16}{-3} = y$$

Invariant.

$$-3x - 16 = \frac{x + 16}{-3}$$

$$+9x + 48 = x + 16$$

$$9x - x = 16 - 48$$

$$8x = -32$$

$$x = -4$$

$$(-4, -4)$$

9. Given the function $f(x) = \sqrt{x}$, sketch:

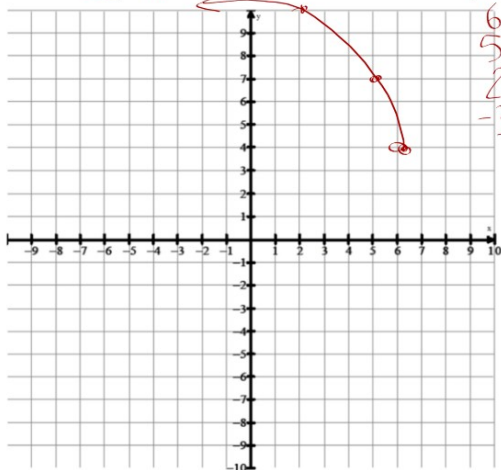
a. $g(x) = 3[f(-(x-6))] + 4$

$$f(x) = \sqrt{x}$$

x	y
0	0
1	1
4	2
9	3

$$(x, y) \rightarrow (-x+6, 3y+4)$$

x	y
6	4
5	7
2	10
-3	13



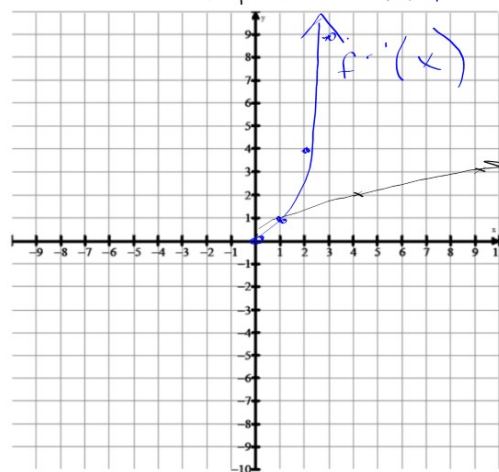
b. $f^{-1}(x)$

$$f(x) = \sqrt{x}$$

x	y
0	0
1	1
4	2
9	3

$$f^{-1}(x) = x^2$$

x	y
0	0
1	1
2	4
3	9



$$h(x)$$