

HW 6.7

1. $f^{-1}(x) = \frac{x-1}{2}$
2. $f^{-1}(x) = \sqrt{3-x}$
5. See graph
3. $f^{-1}(x) = 2x + 8$
4. $f^{-1}(x) = \frac{2x+1}{1-x}$
6. $3x^2 + 8x - 3$
7. $x + 2, x \neq 1/3$
8. $1/(x+2), x \neq 1/3, -2$
9. $3x^2 + 2x - 1$
10. $9x^2 + 15x - 7$

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For each of the following functions:

- a. Find the inverse algebraically
- b. Don't forget to state Domain and Range for $f(x)$ and $f^{-1}(x)$

1. $f(x) = 2x + 1$
 $x = 2y + 1$
 $2y = x - 1$
 $y = \frac{x-1}{2}$
 $f^{-1}(x) = \frac{x-1}{2}$
 $D: \{x | x \in \mathbb{R}\}$
 $R: \{y | y \in \mathbb{R}\}$
2. $f(x) = -x^2 + 3, x \geq 0$
 $x = -y^2 + 3$
 $y^2 = 3 - x$
 $y = \pm \sqrt{3-x}$
 $f^{-1}(x) = \pm \sqrt{3-x}$
 $D: \{x | x \leq 3\}$
 $R: \{y | y \geq 0\}$

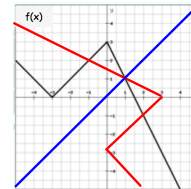
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3. $f(x) = \frac{1}{2}x - 4$
 $x = \frac{1}{2}y - 4$
 $\frac{1}{2}y = x + 4$
 $y = 2x + 8$
 $f^{-1}(x) = 2x + 8$
 $D: \{x | x \in \mathbb{R}\}$
 $R: \{y | y \in \mathbb{R}\}$
4. $f(x) = \frac{x-1}{x+2}$
 $x = \frac{y-1}{y+2}$
 $xy + 2x = y - 1$
 $2x + 1 = y - xy$
 $2x + 1 = y(1-x)$
 $y = \frac{2x+1}{1-x}$
 $f^{-1}(x) = \frac{2x+1}{1-x}$
 $D: \{x | x \neq 1\}$
 $R: \{y | y \neq -2\}$

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5. Given the graph of $f(x)$, graph the inverse.
 Is $f(x)$ a 1-1 function? Explain your answer.

No, $f(x)$ does not pass
the horizontal line test



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For 6-9, $f(x) = 3x - 1$ and $g(x) = 3x^2 + 5x - 2$, find each of the following compositions. State any domain restrictions where they exist.

6. $(f \circ g)(x) = f(g(x))$
 $= 3(3x^2 + 5x - 2) - 1$
 $= 9x^2 + 15x - 7$
7. $\left(\frac{g}{f}\right)(x) = \frac{g(x)}{f(x)}$
 $= \frac{3x^2 + 5x - 2}{3x - 1}$
 $= \frac{(3x-1)(x+2)}{3x-1}$
 $= x+2, x \neq \frac{1}{3}$

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8. $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$
 $= \frac{3x-1}{3x^2+5x-2}$
 $= \frac{3x-1}{(3x-1)(x+2)}$
 $= \frac{1}{x+2}$
 $x \neq -2, -\frac{1}{3}$
9. $(g - f)(x) = g(x) - f(x)$
 $= 3x^2 + 5x - 2 - (3x - 1)$
 $= 3x^2 + 2x - 1$

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Transformations of Functions

Jan 16-7:58 PM

Warm-Up: $f(x) = 2x + 1$ and $g(x) = \frac{1}{2}x - \frac{1}{2}$, find $f(g(x))$ and $g(f(x))$.

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

$$g(f(x)) = \frac{1}{2}(2x + 1) - \frac{1}{2} = x + \frac{1}{2} - \frac{1}{2} = x$$

Thinking about the last question from W 9.7, what do you think this means about the relationship between f and g ?

OMIT

Jan 16-8:00 PM

Some Parent Functions we've studied so far this year:

Function	Name	Sketch
$f(x) = x$	Linear	
$f(x) = x^2$	Quadratic	
$f(x) = x^3$	Cubic	
$f(x) = \sqrt{x}$	Square Root	

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You studied transformations (a little) in Geometry. Here is a reminder of some things you learned.

Given $f(x)$ and $g(x)$ as parent functions, write an equation of the transformed function.

Transformation	Function Notation	Example	$f(x) = x^2$	$g(x) = \sqrt{x}$
Vertical Translation	$f(x) \pm k$	Up 2 units	$= x^2 + 2$	$= \sqrt{x} + 2$
Horizontal Translation	$f(x \pm h)$	Right 4 units	$= (x - 4)^2$	$= \sqrt{x - 4}$
Vertical Stretch	$af(x)$ $a > 1$	Vertical Stretch of 3	$= 3x^2$	$= 3\sqrt{x}$
Vertical Compression	$af(x)$ $0 < a < 1$	Vertical Compression of $\frac{1}{3}$	$= \frac{1}{3}x^2$	$= \frac{1}{3}\sqrt{x}$
Reflection in x-axis	$-f(x)$	Γ_x -axis	$= -x^2$	$= -\sqrt{x}$
Reflection in y-axis	$f(-x)$	Γ_y -axis	$= (-x)^2$	$= \sqrt{-x}$

x-values $\rightarrow$ inside y-values $\rightarrow$ outside

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Give the name of the parent function and describe the transformation (read left to right)

1. $f(x) = x^2 - 3$

Parent: $f(x) = x^2$
quadratic

Transformation(s):
down 3

2. $k(x) = -2(x+1)^3 + 3$

Parent: $k(x) = x^3$
cubic

Transformation(s):
① left 1
② up 3
③ x-axis
④ vertical stretch of 2

Given the parent function and a description of the transformation, write the equation of the transformed function, $f(x)$.

5. linear $\rightarrow$ vertical compression of $\frac{1}{2}$ and down 3
 $f(x) = x$ $f(x) = \frac{1}{2}x - 3$

6. square root $\rightarrow \Gamma_y$ -axis and up 4
 $f(x) = \sqrt{x}$ $f(x) = \sqrt{-x} + 4$

7. quadratic $\rightarrow$ vertical stretch of 5, right 2, and down 1
 $f(x) = x^2$ $f(x) = 5(x-2)^2 - 1$

8. absolute value $\rightarrow \Gamma_x$ -axis, up 2
 $f(x) = |x|$ $f(x) = -|x| + 2$

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9. Given the graph of $f(x)$, sketch the graphs $g(x)$ and $h(x)$ on the same set of axes where

a. $g(x) = f(x + 2) - 3$
left + 2 down 3

b. $h(x) = -2(f(x))$
-2 · y

Part B

x	y
-5	-3
-1	1
1	-1
4	5

x	y
-5	6
-1	-2
1	2
4	-10

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Vertical Stretch or Compression

10. How does the graph $g(x) = ax^2$, where $|a| > 1$, differ from the parent graph $f(x) = x^2$?

☒ a. The graph of g is a horizontal translation of f .

☒ b. The graph of g is a vertical translation of f .

☐ c. The graph of g is a wider parabola than the graph of f .

☒ d. The graph of g is a narrower parabola than the graph of f .

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Dec 10-7:52 AM