HW 6.6

1 - 3 see graphs next page

4. the first and last graphs both pass the vertical line test

   the last graph is the only function that also passes the horizontal line test

5. a. Sketch - see next page
   b. No. The height of the ball will repeat so y-values are not unique.

6. See next page

For each of the following functions:

a. Graph using a table of values

b. Find the inverse graphically (remember, switch x and y values)

c. Determine if the function is 1 - 1

Alg2CC HW 8.7

1. $f(x) = 2x + 1$

ⓐ $f(x)$

x	-2	-1	0	1	2
y	-3	-1	1	3	5

D: $\{x \mid x \in \mathbb{R}\}$

R: $\{y \mid y \in \mathbb{R}\}$

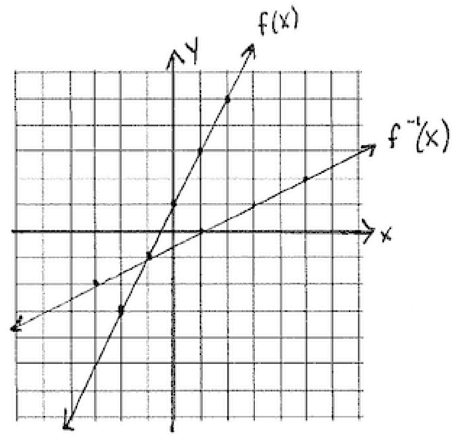
ⓑ $f^{-1}(x)$

x	-3	-1	1	3	5
y	-2	-1	0	1	2

D: $\{x \mid x \in \mathbb{R}\}$

R: $\{y \mid y \in \mathbb{R}\}$

ⓒ yes



2. $y = -x^2 + 3, x \ge 0$

ⓐ $f(x)$:

x	0	1	2	3	4
y	3	2	-1	-6	-13

D: $\{x \mid x \ge 0\}$ R: $\{y \mid y \le 3\}$

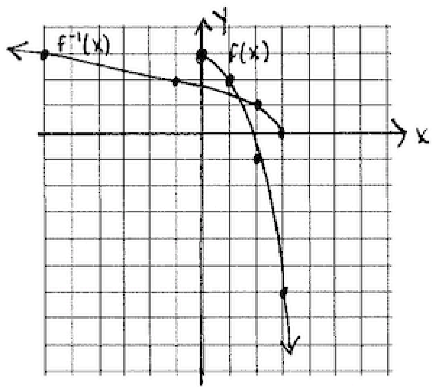
ⓑ $f^{-1}(x)$

x	3	2	-1	-6	-13
y	0	1	2	3	4

D: $\{x \mid x \le 3\}$

R: $\{y \mid y \ge 0\}$

ⓒ yes



3. $y = \frac{1}{2}x - 4$

ⓐ $f(x)$

x	-4	-2	0	2	4
y	-6	-5	-4	-3	-2

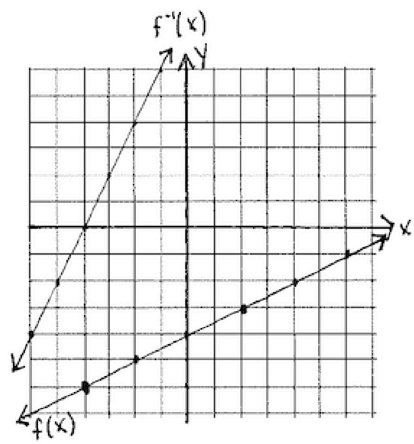
ⓑ $f^{-1}(x)$

x	-6	-5	-4	-3	-2
y	-4	-2	0	2	4

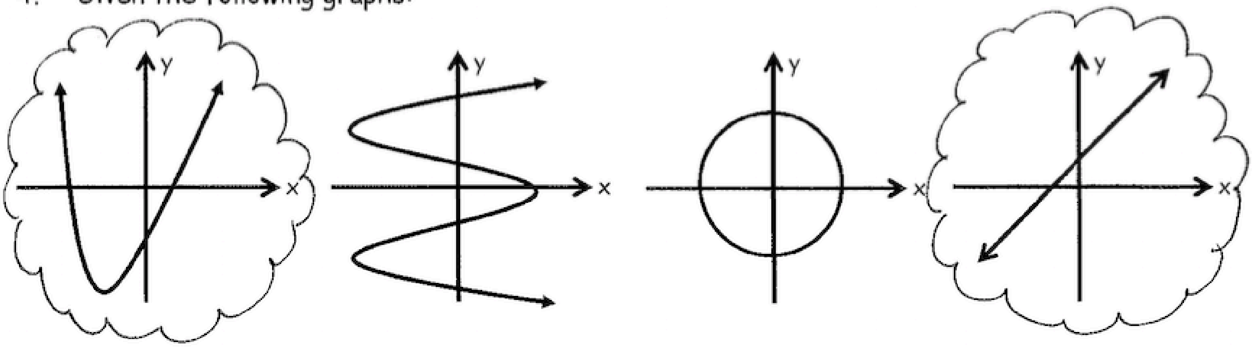
for both D: $\{x \mid x \in \mathbb{R}\}$

R: $\{y \mid y \in \mathbb{R}\}$

ⓒ yes



4. Given the following graphs:



Circle the two graphs above that are functions. Explain how you know they are functions.

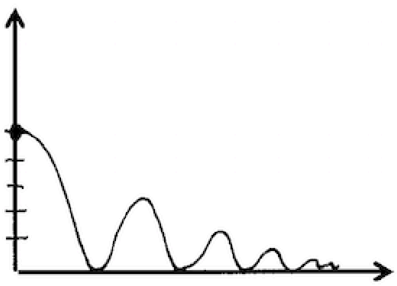
the first and last graphs both pass the vertical line test

Of the two graphs you circled, which is one-to-one? Explain how you can tell from its graph.

the last graph is the only function that also passes the horizontal line test.

5. Physics students drop a basketball from 5 feet above the ground and its height is measured each tenth of a second until it stops bouncing. The height of the basketball, h, is a function of time, t, since it was released.

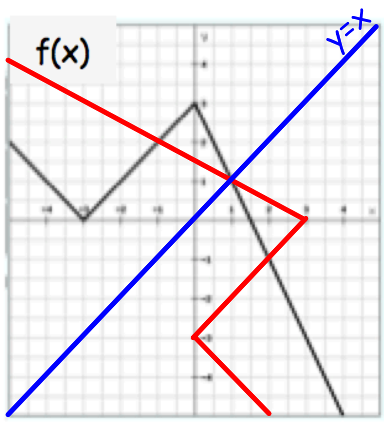
a. Sketch what you think this function would look like.



b. Is the height of the ball a 1 - 1 function? Explain your answer.

No. the height of the ball will repeat so y-values are not unique

6. A function is graphed at the left. Sketch it's inverse on the same graph.



HW 6.7

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

2. $f^{-1}(x) = +\sqrt{3-x}$

3. $f^{-1}(x) = 2x + 8$

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

5. See graph

6. $3x^2 + 8x - 3$

7. $x + 2, x \neq 1/3$

8. $1/(x + 2), x \neq 1/3, -2$

9. $3x^2 + 2x - 1$

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. $f(x) = 2x + 1$

$D: \{x \mid x \in \mathbb{R}\}$
$R: \{y \mid y \in \mathbb{R}\}$

$x = 2y + 1$

$2y = x - 1$

$y = \frac{x-1}{2}$

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

$D: \{x \mid x \in \mathbb{R}\}$
$R: \{y \mid y \in \mathbb{R}\}$

2. $f(x) = -x^2 + 3,\ x \geq 0$

D:

R: $\{y \mid y \leq 3\}$

$x = -y^2 + 3$

$y^2 = 3 - x$

$y = \pm\sqrt{3-x}$

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

$D: \{x \mid x \leq 3\}$
$R: \{y \mid y \geq 0$

3. $f(x) = \frac{1}{2}x - 4$

$D: \{x \mid x \in \mathbb{R}\}$
$R: \{y \mid y \in \mathbb{R}\}$

$x = \frac{1}{2}y - 4$

$\frac{1}{2}y = x + 4$

$y = 2x + 8$

$f^{-1}(x) = 2x + 8$

$D: \{x \mid x \in \mathbb{R}\}$
$R: \{y \mid y \in \mathbb{R}\}$

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

$D: \{x \mid x \neq -2\}$
$R: \{y \mid y \neq 1\}$

$x = \frac{y-1}{y+2}$

$xy + 2x = y - 1$

$2x + 1 = y - xy$

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

$y = \frac{2x+1}{1-x}$

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

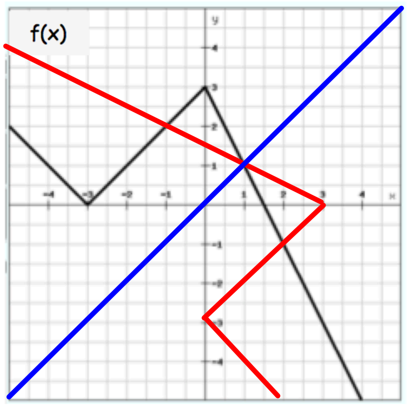
$D: \{x \mid x \neq 1\}$
$R: \{y \mid y \neq -2\}$

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



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. $(f + g)(x) = f(x) + g(x)$

$= 3x - 1 + 3x^2 + 5x - 2$

$= 3x^2 + 8x - 3$

7. $\left(\frac{g}{f}(x)\right) = \frac{g(x)}{f(x)}$

$= \frac{3x^2 + 5x - 2}{3x - 1}$

$= \frac{(3x-1)(x+2)}{3x-1}$

$= x + 2 \qquad x \neq \frac{1}{3}$

8. $\left(\frac{f}{g}(x)\right) = \frac{f(x)}{g(x)}$

$= \frac{(3x-1)}{(3x-1)(x+2)}$

$= \frac{1}{x+2}$

$x \neq 1/3, -2$

9. $(g - f)(x) = g(x) - f(x)$

$= 3x^2 + 5x - 2 - (3x - 1)$

$= 3x^2 + 5x - 2 - 3x + 1$

$= 3x^2 + 2x - 1$

Transformations of Functions

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

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

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

OMIT

Thinking about the las[illegible]tion from HW[illegible]you think this means about the relationship between f and [illegible]

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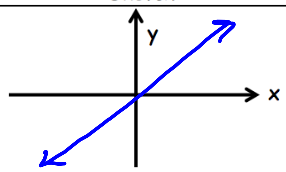
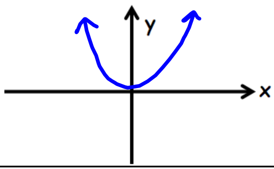
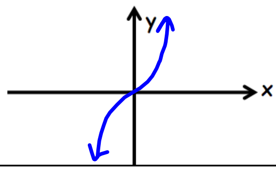
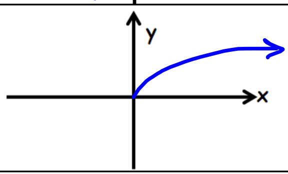
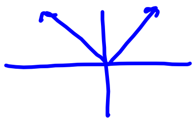
Some Parent Functions we've studied so far this year:

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

$f(x) = |x|$ Abs. Value



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 y	f(x) ± k up down outside	Up 2 units	$f(x)=x^2+2$	$g(x)=\sqrt{x}+2$
Horizontal Translation x	f(x ± h) left right inside	Right 4 units	$f(x)=(x-4)^2$	$g(x)=\sqrt{x-4}$
Vertical Stretch y	af(x) a > 1 mult. out.	Vertical Stretch of 3	$f(x)=3x^2$	$g(x)=3\sqrt{x}$
Vertical Compression y	af(x) 0 < a < 1 mult. out.	Vertical Compression of 1/3	$f(x)=\frac{1}{3}x^2$	$g(x)=\frac{1}{3}\sqrt{x}$
Reflection in x-axis -y	-f(x) outside	$r_{x\text{-axis}}$	$f(x)=-(x)^2$	$g(x)=-\sqrt{x}$
Reflection in y-axis ~~x-axis~~ -x	f(-x) inside	$r_{y\text{-axis}}$	$f(x)=(-x)^2$	$g(x)=\sqrt{-x}$

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

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

Parent: quadratic

$f(x) = x^2$

Transformation(s):

Tranlation down 3

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

Parent: cubic

$f(x) = x^3$

Transformation(s):

Translation left 1 and up 3

Vert. stretch x2

reflection across x-axis

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

5. linear → vertical compression of $\frac{1}{2}$ and down 3

$$f(x) = \frac{1}{2}x - 3$$

6. square root → $r_{y\text{-axis}}$ and up 4

$$f(x) = \sqrt{-x} + 4$$

7. quadratic → vertical stretch of 5, right 2, and down 1

$$f(x) = 5(x-2)^2 - 1$$

8. absolute value → $r_{x\text{-axis}}$, up 2

$$f(x) = -|x| + 2$$

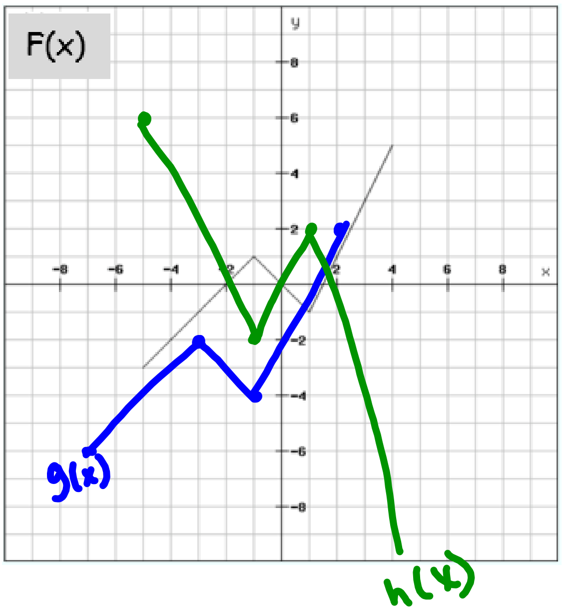
9. Given the graph of f(x), sketch the graphs g(x) and h(x) on the same set of axes where

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

left 2 down 3

b. h(x) = -2(f(x))

x	f(x) y	-2(y)
-5	-3	6
-1	1	-2
1	-1	2
4	5	-10



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.

vert. stretch