HW 6.8

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

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

3. a. var in denom
   b. D: {x|x ≠ 3/2}
   c. see graph next page
   d. R: {y|y ≠ 0}

4. a. var under radical
   b. D: {x|x ≤ 3}
   c. see graph next page
   d. R: {y|y ≥ 0}

5. $P(x) = x^2$ Quadratic

   $r_{x\text{-axis}}$, left 1, down 2

6. $P(x) = \sqrt{x}$ Sqr. root

   vertical stretch 2,

   right 1

7. $P(x) = x^3$ cubic

   right 3, up 1

8. $P(x) = x$ linear

   Vertical Stretch 3

   down 4

9. b

10. D: [-5, 11]

Find the inverse for each function algebraically.

1. $f(x) = \sqrt{x} - 1$

D: $\{x \mid x \geq 0\}$
R: $\{y \mid y \geq -1\}$

$x = \sqrt{y} - 1$
$(x+1)^2 = y$
$f^{-1}(x) = (x+1)^2$
D: $\{x \mid x \geq -1\}$
R: $\{y \mid y \geq 0\}$

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

D: $\{x \mid x \neq -\frac{3}{2}\}$
R: $\{y \mid y \neq -1\}$

$x = \frac{1-2y}{2y+3}$
$2xy + 3x = 1 - 2y$
$2xy + 2y = 1 - 3x$
$y(2x+2) = 1 - 3x$
$y = \frac{1-3x}{2x+2}$
$f^{-1}(x) = \frac{1-3x}{2x+2}$ $\{x \mid x \neq -1\}$ $\{y \mid y \neq -\frac{3}{2}\}$

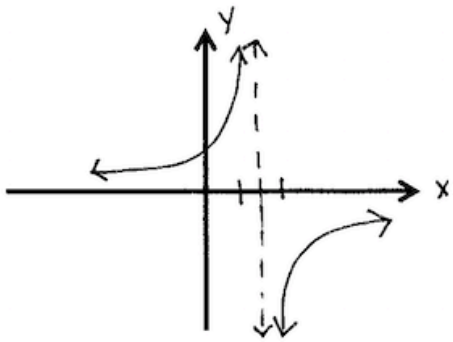
For each of the following,
a. State the type of trouble.
b. Find the domain algebraically.
c. Sketch the graph.
d. Use the graph to find the range.

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

a. var in denominator
$3 - 2x \neq 0$
$x \neq 3/2$

b. $\{x \mid x \neq 3/2\}$

c.



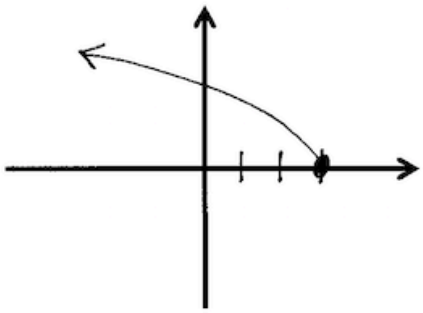
d. $\{y \mid y \neq 0\}$

4. $y = \sqrt{3-x}$

a. variable under $\sqrt{\ }$
$3 - x \geq 0$
$-x \geq -3$
$x \leq 3$

b. $\{x \mid x \leq 3\}$

c.



d. $\{y \mid y \geq 0\}$

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

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

Parent: $P(x) = x^2$ Quadratic

Transformation(s):

r x-axis
left 1
down 2

6. $g(x) = 2\sqrt{x-1}$

Parent: $P(x) = \sqrt{x}$ Square root

Transformation(s):

vertical stretch 2
right 1

7. $j(x) = (x - 3)^3 + 1$

Parent: $P(x) = x^3$ Cubic

Transformation(s):

right 3
up 1

8. $k(x) = 3x - 4$

Parent: $P(x) = x$ linear

Transformation(s):

Vertical stretch 3
down 4

9. The graph of the quadratic function f is shown below. If the graph of f is translated 5 units to the right and 4 units down to create a new graph, which function best represents this new graph?

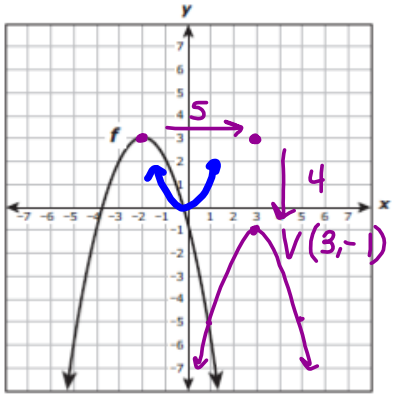
$g(x) = f(x-5) - 4$

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

b. $g(x) = -(x - 3)^2 - 1$

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

d. $g(x) = (3 - x)^2 - 1$



10. Given the table of values for f, what is the domain for f^{-1} (in interval notation)?

x	-3	-1	0	2	3	5
y	-5	-1	1	5	7	11

$\{-5, -1, 1, 5, 7, 11\}$

$f(x)$: D : $[-3, 5]$

R : $[-5, 11]$

$f^{-1}(x)$: D $[-5, 11]$

this is a line but a list of points usually not interval notation

Applications of Functions

Warm-Up: Let $f(x) = 3x + 1$ and $g(x) = x^2 - 1$. Perform each indicated operation. State domain restrictions where they exist.

1. $(f \cdot g)(x) = f(x) \cdot g(x)$ must.

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

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

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

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

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

$-x^2+3x+2$

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

$x \neq \pm 1$

$x^2-1 \neq 0$

$x^2 \neq 1$

$x \neq \pm 1$

4. $g(f(x)) = g(3x+1)$

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

$(3x+1)(3x+1)-1$

$9x^2+6x+1-1$

$9x^2+6x$

1. How can you rewrite $y = \sqrt{9x+18}$ so you can graph it using transformations? Think about the following: what is the parent graph and what transformations have occurred?

$y = \sqrt{9(x+2)} = \sqrt{9}\sqrt{x+2}$

$\sqrt{9+7} \neq \sqrt{9}+\sqrt{7}$

$y = 3\sqrt{x+2}$

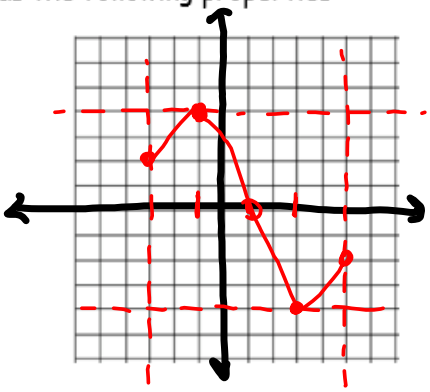
Square Root fxn

Vert. stretch x3

Left 2

2. On the accompanying graph, draw a function that has the following properties:

   a. Domain: [-3, 5]
   b. Range: [-4, 4]
   c. Decreasing in the interval (-1, 3)
   d. Maximum at (-1, 4)



3. Given $f(x) = x + 2$ and $g(x) = x^2 + 2x$, perform the operation or composition. State domain restrictions if they exist.

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

$(x+2) + (x^2+2x)$

$x^2 + 3x + 2$

b. $g(f(x)) = g(x+2)$

$(x+2)^2 + 2(x+2)$

$(x+2)(x+2) + 2x + 4$

$x^2 + 4x + 8 + 2x$

$x^2 + 6x + 8$

c. $\left(\frac{g}{f}(x)\right) = \frac{g(x)}{f(x)} = \frac{x^2+2x}{x+2} = \frac{x(x+2)}{x+2} = x$

$x \neq -2$

4. Given the function $f(x) = x^3 + 2x$ write a function that is

a. 3 units up and 1 unit left

$g(x) = f(x+1) + 3$

$g(x) = (x+1)^3 + 2(x+1) + 3$

b. 2 units down and 4 units right

$g(x) = f(x-4) - 2$

$g(x) = (x-4)^3 + 2(x-4) - 2$

c. Reflected in the x-axis and vertically stretched by a factor of 2

$g(x) = -2f(x)$

$g(x) = -2(x^3 + 2x) = -2x^3 - 4x$