HW 6.5

1. a. double trouble
   b. D: $\{x|x > -\frac{1}{2}\}$
   c. see graph next page
   d. R: $\{y|y < 0\}$

1.	3	2.	11	3.	29
4.	$-x^2 + 5x + 2$	5.	8	6.	11
7.	$9x^2 + 6x$	8.	$3x^2 - 6x + 2$	9.	A
10.	b	11.	-4	12.	3
13.	5	14.	-4	15.	3

16. K(30) = 303.15
    S(303.15) = 352.5 m/s

HW 6.5

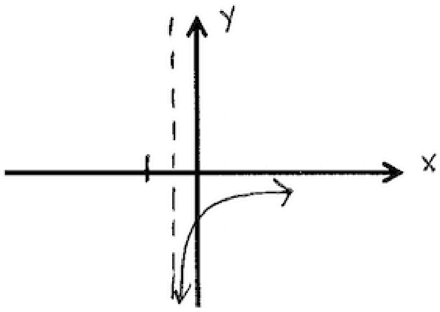
1. a. State the type of trouble.
   b. Find the domain algebraically.
   c. Sketch the graph.
   d. Use the graph to find the range.

$y = \frac{-3}{\sqrt{2x+1}}$

a. double trouble
var under $\sqrt{\ }$ in denom

$2x+1>0$
$2x>-1$

b. $\{x \mid x > -\frac{1}{2}\}$

c. 

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

Given: $f(x) = x^2 - 2x$, $g(x) = 3x + 2$, and $h(x) = \sqrt{x+1}$ find each of the following:

1. $f(g(-1)) = f(-1) = 3$

$g(-1) = 3(-1) + 2 = -1$
$f(-1) = (-1)^2 - 2(-1) = 3$

2. $g(f(-1)) = g(3) = 11$

$f(-1) = 3$ (see #1)
$g(3) = 3(3) + 2 = 11$

3. $(g + h)(8) = g(8) + h(8)$
$= 26 + 3 = 29$

$g(8) = 3(8) + 2 = 26$
$h(8) = \sqrt{8+1} = 3$

4. $(g - f)(x) = g(x) - f(x)$
$= 3x + 2 - x^2 + 2x$
$= -x^2 + 5x + 2$

5. $(g \circ h)(3) = g(h(3)) = g(2) = 8$

$h(3) = \sqrt{3+1} = 2$
$g(2) = 3(2) + 2 = 8$

6. $g(h(f(4))) = g(h(8)) = g(3) = 11$

$f(4) = 4^2 - 2(4) = 8$
$h(8) = \sqrt{8+1} = 3$
$g(3) = 11$ (see #2)

7. $(f \circ g)(x) = f(g(x))$
$= f(3x+2) = (3x+2)^2 - 2(3x+2)$
$= 9x^2 + 12x + 4 - 6x - 4$
$= 9x^2 + 6x$

8. $(g \circ f)(x) = g(f(x)) = 3x^2 - 6x + 2$
$g(x^2 - 2x) = 3(x^2 - 2x) + 2$
$= 3x^2 - 6x + 2$

9. If $g(x) = 3x - 5$ and $h(x) = 2x - 4$, then $(g \circ h)(x) =$

a. $6x - 17$
b. $6x - 14$
c. $5x - 9$
d. $x - 1$

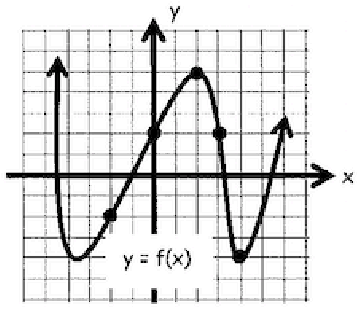
$g(h(x)) = 3(2X-4)-5$
$= 6X - 12 - 5$

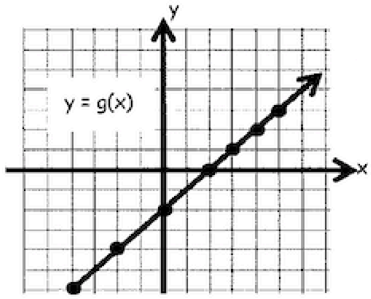
10. If $f(x) = x^2 + 5$ and $g(x) = x + 4$, then $f(g(x)) =$

a. $x^2 + 9$
b. $x^2 + 8x + 21$
c. $4x^2 + 20$
d. $x^2 + 21$

$f(X+4) = (X+4)^2 + 5$
$= (X+4)(X+4) + 5$
$= X^2 + 8X + 16 + 5$

11 – 15: The graphs below are the functions $y = f(x)$ and $y = g(x)$. Evaluate each of the following questions based on these two graphs.





11. $g(f(-2)) =$ $g(-2) = -4$
$f(-2) = -2$

12. $(f + g)(3) =$ $2 + 1 = 3$
$f(3) + g(3)$

13. $(f \circ g)(4) =$ $f(g(4)) = 5$
$g(4) = 2 \rightarrow f(2) = 5$

14. $(f \cdot g)(0) =$ -4
$f(0) \cdot g(0) = 2(-2)$

15. $(g \circ f)(2) =$ 3
$g(f(2))$ $f(2) = 5$
$g(5) = 3$

16. Physics students are studying the effect of temperature, T, on the speed of sound, S. They find that the speed of sound in meters per second is a function of the temperature in degrees Kelvin, K, by $S(K) = \sqrt{410K}$. The degrees Kelvin is a function of the temperature in Celsius given by $K(C) = C + 273.15$. Find the speed of sound when the temperature is 30 degrees Celsius. Round to the nearest tenth.

$K(30) = 30 + 273.15$
$= 303.15$

$S(303.15) = \sqrt{410(303.15)}$
$= 352.5$ m/s

Quiz tomorrow on Days 4 & 5

(pay special attention to notations!!!)

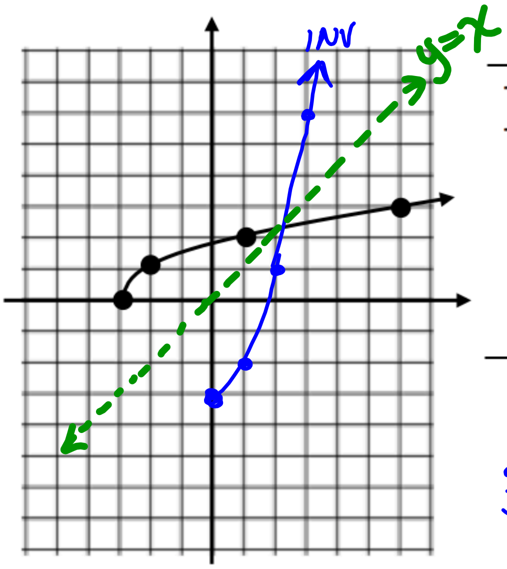
Inverse Relation → the set of ordered pairs obtained by interchanging the 1st & 2nd elements of each pair of a relation.

Taking the inverse is the same as a reflection in the line $y = x$

To find an inverse graphically:

For 1 & 2:

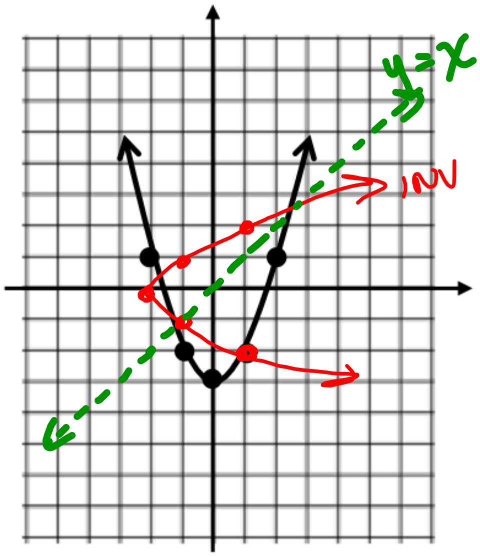
a. Make a table and graph the inverse relation.
b. State the domain and range for the relation & inverse.



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

INV

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



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

INV

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

Relation:

D: $[-3,\infty)$

R: $[0,\infty)$

Inverse:

D: $[0,\infty)$

R: $[-3,\infty)$

Relation:

D: $(-\infty,\infty)$

R: $[-3,\infty)$

Inverse:

D: $[-3,\infty)$

R: $(-\infty,\infty)$

What are some things that you notice about the relationship between the two function and their inverses?

- Domain and Range switch
- $r_{y=x}$

What are some things that you notice about the relationship between the two functions and their inverses?

One-to-One Function (1 - 1 function) → A **function** in which each element of the range corresponds to exactly one element of the domain. Passes both the **vertical** AND **horizontal** line tests.

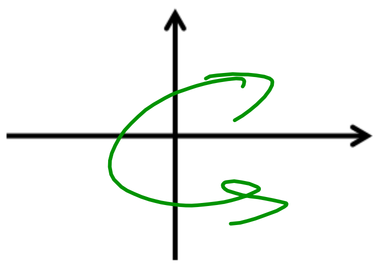
What do you think the **horizontal** line test is?

A test to see if each y-value has only one x-value.

A test to see if the inverse is a function.

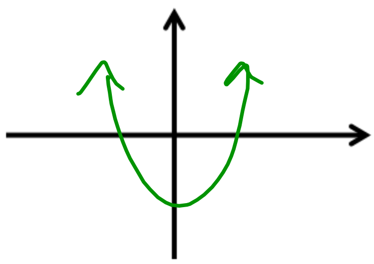
Horizontal Line Test → A **function** is 1 – 1 if a horizontal line does not intersect the graph in more than one point.

Draw three relations that meet the following conditions: 1 that is not a function, 1 that is a function but not 1 – 1, and 1 that is a 1 – 1 function. Have your partner verify your graphs.



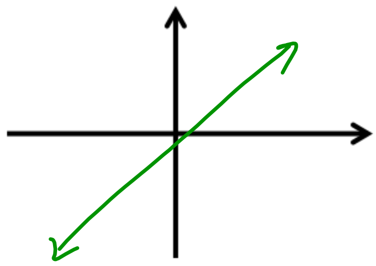
Relation only

fails vert. l.t.



Function, not 1 – 1

Passes Vert.
fails horiz.



1 – 1 Function

Passes
both
line
tests

Determine if each of the relations below are 1 - 1 functions. If not, explain why not. For equations, you can sketch or use a table of values to demonstrate your knowledge of the relation.

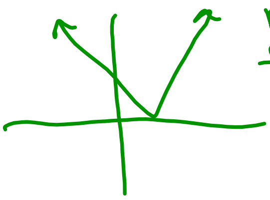
3. {(2, 3), (3, 2), (4, 5), (5, 4)}

yes 1 to 1

4. {(2, -1), (3, -2), (2, -4), (-4, 3)}

No $x = 2$ has 2 y's

5. $y = |x - 1|$



no fails horiz. line test

6. $y = x + 44$

yes 1 to 1

(line)

7. Given f(x) = 2x - 6

a. Make a table & graph the function & its' inverse.

b. State the domain & range for the function & the inverse

f(x)

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

D: $(-\infty,\infty)$
R: $(-\infty,\infty)$

INV

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

D: $(-\infty,\infty)$
R: $(-\infty,\infty)$