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

Jan 16-1:07 PM

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 → asymptote
var under $\sqrt{}$ in denom
$2x+1 > 0$
$2x > -1$

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

c. $x = -\frac{1}{2}$

d. $\{y|y < 0\}$ $(-\infty, 0)$

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. $(g \circ h)(8) = g(8) + h(8)$
   $= 16 + 3 = 29$
   $g(8) = 3(8) + 2 = 26$
   $h(8) = \sqrt{8+1} = 3$
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. $(g \circ f)(x) = g(f(x)) = 3x^2 - 6x + 2$
   $g(x^2 - 2x) = 3(x^2 - 2x) + 2$
   $= 3x^2 - 6x + 2$

Jan 11-8:51 PM

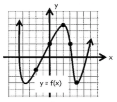
9. If $g(x) = 3x - 5$ and $h(x) = 2x - 4$, then $(g \circ h)(x) =$
   a. $6x - 17$
   b. $6x - 14$
   c. $5x - 9$
   d. $x - 1$

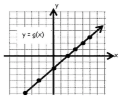
$g(h(x)) = 3(2x-4) - 5$
$= 6x - 12 - 5$

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. $(f + g)(3) = 2 + 1 = 3$ $f(3) + g(3)$
    $f(3) + g(3)$
13. $(f \circ g)(4) = f(g(4)) = 5$
    $g(4) = 2 \rightarrow f(2) = 5$
14. $(f \cdot g)(0) = -4$ $f(0) \cdot g(0)$
    $f(0) \cdot g(0) = 2(-2)$
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

Jan 11-8:51 PM

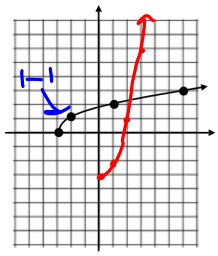
Inverse Relation → the set of ordered pairs obtained by interchanging the 1st & 2nd elements of each pair of a relation.

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

Nov 20-3:55 PM

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.

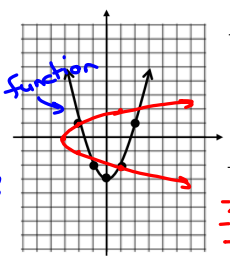


x	y
-3	0
-2	1
1	2
6	3

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

Relation: Inverse:

D: $[-3, \infty)$ D: $[0, \infty)$
R: $[0, \infty)$ R: $[-3, \infty)$



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

1	-2
-2	-1
-3	0
-2	1
1	2

Relation: Inverse:

D: $(-\infty, \infty)$ D: $[-3, \infty)$
R: $[-3, \infty)$ R: $(-\infty, \infty)$

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

Domain and range are flipped

Nov 20-3:56 PM

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.

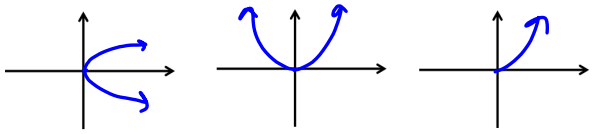
What do you think the **horizontal** line test is?

Checks for repeating y-values

Jan 16-1:28 PM

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
Does not pass the VLT

Function, not 1 – 1
Pass VLT
Fail HLT

1 – 1 Function
Pass Both VLT & HLT

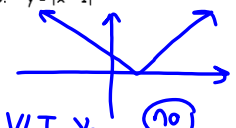
Nov 20-3:56 PM

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 x-values ✓ function
② y-values ✓ 1-1 function

4. {(2, -1), (3, -2), (2, -4), (-4, 3)}
① x no 2 repeats
② y

5. $y = |x - 1|$



VLT Yes
HLT No
(no)

6. $y = x + 44$ line

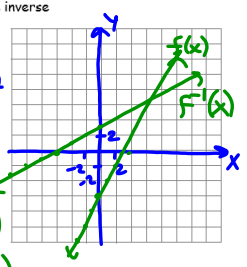
VLT ✓
HLT ✓
(Yes)

Nov 27-2:03 PM

7. Given $f(x) = 2x - 6$ $y = 2x - 6$
   a. Make a table & graph the function & its' inverse.
   b. State the domain & range for the function & the inverse

x	-3	-2	-1	0	1	2	3
y	-12	-10	-8	-6	-4	-2	0

x	-12	-10	-8	-6	-4	-2	0
y	-3	-2	-1	0	1	2	3



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

Nov 27-2:04 PM

Dec 6-7:29 AM