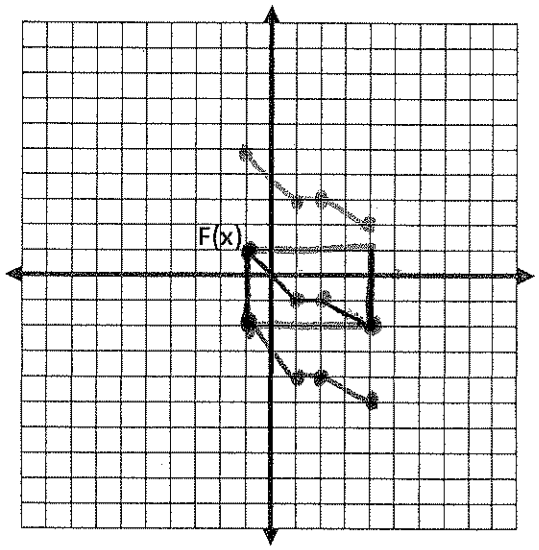
Unit 3 Day 1: Transformations of Functions Name: _____

To the right is a graph of a "piece-wise" function. We'll call this function **F(x)**. We can use **F(x)** to explore transformations in the coordinate plane.



1. How do we know that **F(x)** is a function?
   (Hint: How do we define a function?)
   * VERTICAL LINE TEST: if a vertical line is placed anywhere on a graph, the line can only touch the graph once.
2. What is the domain of **F(x)**? - x values of a function
   $-1 \leq x \leq 4$
3. What is the range of **F(x)**? - y values
   $-2 \leq y \leq 1$

Let's explore the points on F(x).

4. How many points lie on **F(x)**? Can we list them all?
   infinitely many, no we cannot list them all.
5. What are the key points that would help us graph **F(x)**?
   *We are will call these key points **"characteristic" points**. It is important when graphing a function that you are able to identify these characteristic points.*
   (-1,1) (1,-1) (2,-1) (4,-2)
6. Use the graph of **F(x)** to evaluate the following:
   F(1) = -1 ("y" when x = 1) F(−1) = 1 F(5) = N/A UNDEFINED

Remember that F(x) is another name for the y-values

7. Fill the three tables using the graph of **F(x)**.

x	F(x)
−1	1
1	−1
2	−1
4	−2

x	F(x) + 4
−1	5
1	3
2	3
4	2

x	F(x) − 3
−1	−2
1	−4
2	−4
4	−5

8. Graph **F(x) + 4** and **F(x) − 3** in different colors on the coordinate plane above
   (Use the coordinate plane above)
9. In **y = F(x) + 4**, how did the "+4" affect the graph of **F(x)**? What type of *transformation* maps **F(x)** to **F(x) + 4**? (Be specific)
   Translated up 4 units
10. In **y = F(x) − 3**, how did the "−3" affect the graph of **F(x)**? What type of *transformation* maps **F(x)** to **F(x) − 3**? (Be specific)
    Translated down 3 units

11. Fill the three tables using the graph of **F(x)**.

x	F(x)
−1	1
1	−1
2	−1
4	2

x	x + 4	y = F(x + 4)
-5	−1	1
-3	1	-1
-2	2	-1
0	4	-2

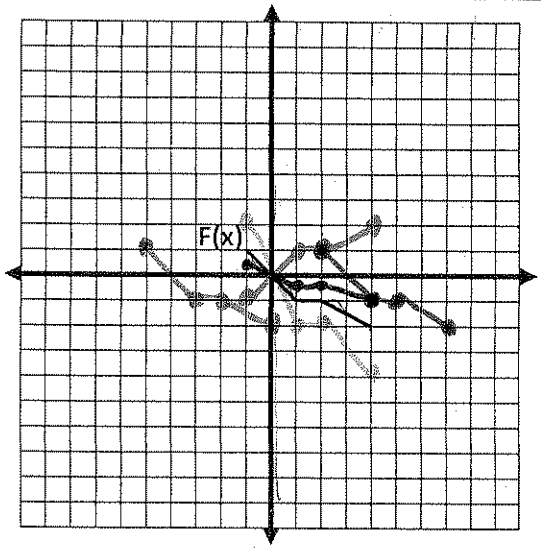
x	(x − 3)	y = F(x − 3)
2	−1	1
4	1	-1
5	2	-1
7	4	-2

***Hint**: In the first box we have x + 4 = -1. If we subtract 4 from both sides of the equation, we get x = -5. Use a similar method to find the remaining x values.*

12. On the coordinate plane to the right:

a. Use one color to graph the 4 ordered pairs (x, y) for **y = F(x + 4).** The first point is (-5, 1).

b. Use a different color to graph the 4 ordered pairs (x, y) for **y = F(x - 3)**.



13. In **y = F(x+4),** how did the "+4" affect the graph of **F(x)**? What type of *transformation* maps **F(x)** to **F(x + 4)**? (Be specific)

translated 4 units to the left

14. In **y = F(x − 3),** how did the "−3" affect the graph of **F(x)**? What type of *transformation* maps **F(x)** to **F(x − 3)**? (Be specific)

translated 3 units to the right

15. Fill the tables using the graph of **F(x).**

x	F(x)
−1	1
1	−1
2	−1
4	−2

x	-F(x)
−1	−1
1	1
2	1
4	+2

x	2F(x)
−1	2
1	−2
2	−2
4	−4

x	½F(x)
−1	½
1	−½
2	−½
4	−1

16. How did each of the following affect the graph of **F(x):**

a) the "-" sign

b) the "2"

c) the "½"

Hint: Use one of the coordinate planes above if needed.

a) reflected over the x-axis

b) stretched the function 2 times the distance from the x-axis

c) compressed the function ½ the distance from the x-axis

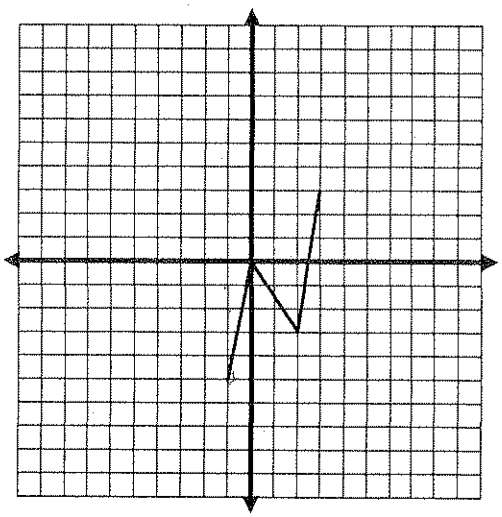
Summary: Describe the effect to F(x) for the following functions.

Equation	Effect on the graph of F(x)
Example: y=F(x + 18)	Translate **F(x)** to the left 18 units
1. y = F(x) – 100	translate down 100
2. y = F(x - 48)	translate to the right 48 units
3. y = F(x) + 32	" " up 32
4. y = -F(x)	reflect over x-axis
5. y = F(x – 10)	translate right 10
6. y = 3F(x)	stretch by 3
7. y = F(x) + 7	translate up 7
8. y = ¼F(x)	compress by 1/4
9. y = F(x) – 521	translate down 521
10. y = F(x) + 73	" " up 73
11. y = -5F(x)	reflect over x axis ; stretch 5
12. y = F(x) – 22	translate down 22
13. y = 2F(x – 13)	stretch vertically by 2, right 13
14. y = F(x + 30) + 18	translate left 30 ; up 18
15. y = -¼F(x) -27	reflect over x-axis, compress by 1/4 , translate down 27

U3D1 Homework

Name: _____

To the right is a graph of a "piece-wise" function that we'll call **H(x)**.



Use **H(x)** to demonstrate what you have learned so far about the transformations of functions.

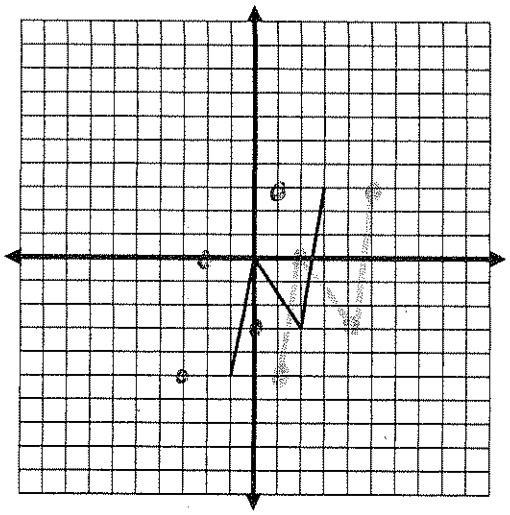
1. What are the characteristic points of **H(x)**?

   (-1,-5) (0,0) (2,-3) (3,3)

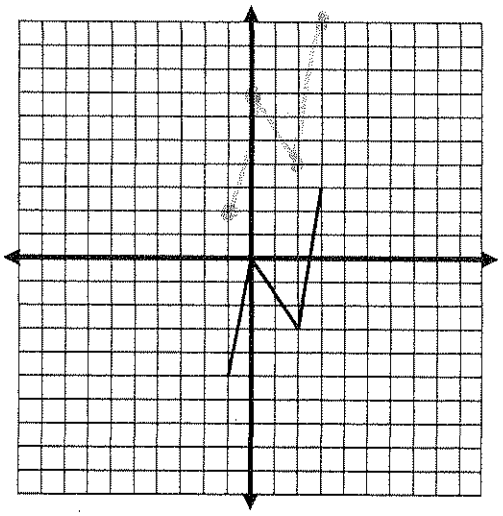
2. Describe the effect on the graph of H(x) for each of the following:
   a. H(x – 2) translate right 2
   b. H(x) + 7 " " up 7
   c. H(x+2) – 3 " " left 2 down 3
   d. -2H(x) reflect over y-axis, stretch vertically by 2

3. Use your answers to questions 1 and 2 to help you sketch each graph *without using a table*.

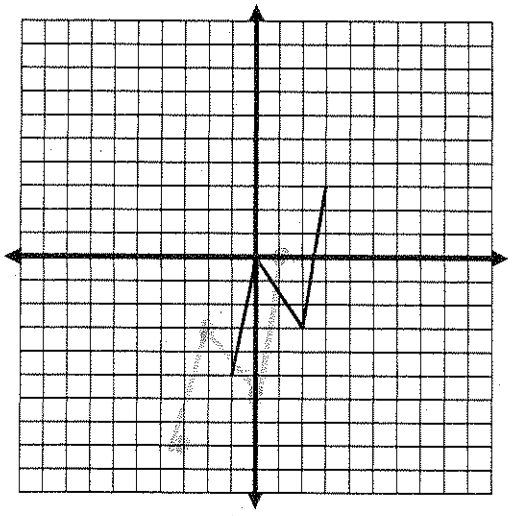
a. y = H(x – 2)



b. y = H(x) + 7



c. y = H(x+2) – 3



d. y = -2H(x)