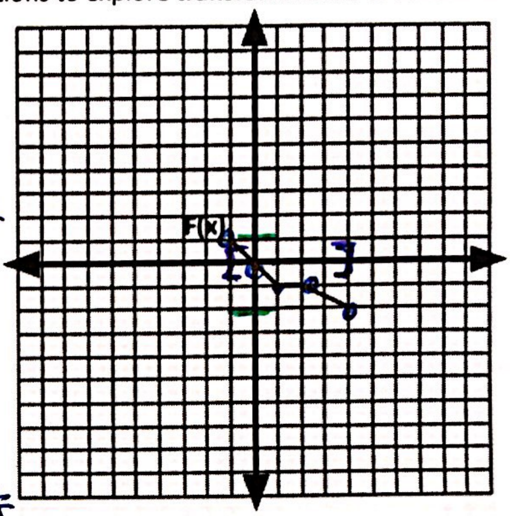
Test: October 3rd

Unit 2A: Quadratics

Name: ______________________

Transformations with Fred Functions
Day 1

To the right is a graph of a **"Fred" function.** We will use Fred functions to explore **transformations of functions** in the coordinate plane.



Part I: Fred

* [ ] means included

1. How do we know that Fred is a function?

(1) Passes the Vertical Line Test
(2) Every input has exactly 1 output

2. a. Using the graph, what is the domain of Fred?

$-1 \leq x \leq 4$ [-1, 4] (x-values)

b. Using the graph, what is the range of Fred?

$-2 \leq y \leq 1$ [-2, 1] (y-values)

3. Let's explore the points on Fred.
   a. How many points lie on Fred? ~~infinite~~ Infinite #
   Can you list them all?

   Nope :)

   b. What are the key points that would help us graph Fred?   Key points = "Nice points"

   (-1, 1) (0, 0) (1, -1) (2, -1) (4, -2)

   We are going to call these key points **"characteristic" points.** It is important when graphing a function that you are able to identify these characteristic points.

   c. Use the graph to evaluate the following.

   F(1) = -1   F(−1) = 1   F(4) = −2   F(5) = undefined

☆★☆ Remember that F(x) is another name for the y-values. Therefore the equation of Fred is **y = F(x).** ☆★☆

4. a. Complete the table below for Fred.

x	F(x)
−1	1
1	-1
2	-1
4	-2

b. Why did we choose those x-values to put in the table? 😊

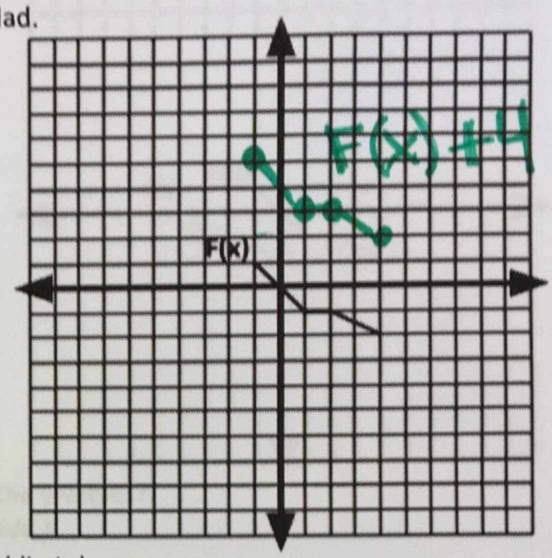
These were ~~all~~ our key points or characteristic points

Fred is what we call the **parent function**. Now, let's take a look at a few of his children, who are **transformations** of their parent.

Part 2: Freddie Jr.

Now, let's try graphing Freddie Jr.: **y = $\boxed{\text{F(x)}}$ + 4**. Complete the table below for this new function, and then graph Freddie Jr. on the coordinate plane with his dad.

Fred



y = F(x) + 4 → up 4 (outside change)

x	y
–1	5
1	3
2	3
4	2

1+4=5
-1+4=3
-1+4=3
-2+4=2

1. How did the "+4" affect the x-values? It didn't
   How did it affect the y-values?
   (Hint: Compare the characteristic points of Fred and Freddie Jr.)
   y-values increased by 4

2. What type of transformation maps Fred, F(x), to Freddie Jr., F(x) + 4? (Be specific.)
   Translated up 4 units

3. In y = F(x) + 4, how did the "+4" affect the domain or the range?
   (x-values) (y-values)
   D: [-1,4] ✱R: [2,5]

4. If Freddie Jr. had been y = F(x) - 4, how would that have been different?
   Translated down 4 units (outside change)

Checkpoint: Using the understanding you have gained so far, describe the effect on Fred for the following functions.

Equation	Effect to Fred's graph
Example: y=F(x) + 18	Translate up 18 units
1. y = F(x) – 100	Translate down 100
2. y = F(x) + 73	
3. y = F(x) + 32	
4. y = F(x) – 521	

Part 3: Freida

(inside change)

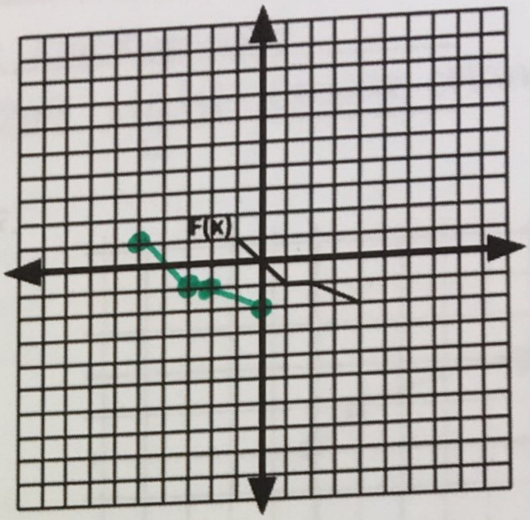
Now, let's try graphing Freida: **y = F(x + 4)**. Complete the table below, then graph Freida with her dad.

(left 4)

x	x + 4	y
−5	−1	1
−3	1	−1
−2	2	−1
0	4	−2

$x+4=-1$
$-4\quad -4$
$x=-5$

$x+4=1$
$-4\quad -4$
$x=-3$



*(**Hint:** Since, x + 4 = −1, subtract 4 from both sides of the equation, and x = −5. Use a similar method to find the missing x values.)*

1. How did the "+4" affect the x-values? How did it affect the y-values? *(Hint: Compare the characteristic points of Fred and Freida.)*

   X-values decreased by 4 units ; It didn't change the y's

2. What type of transformation maps Fred, F(x), to Freida, F(x + 4)? (Be specific.)

   Translated left 4 units

3. In y = F(x + 4), how did the "+4" affect the domain or the range?
   (x-values) (y-values)

   *D: [-5,0]   R: [-2, 1]

4. If Freida had been y = F(x - 4), how would that have been different?

   Translated right 4 units (inside change)

Checkpoint: Using the understanding you have gained so far, describe the effect to Fred for the following functions.

Equation	Effect to Fred's graph
Example 1: y=F(x + 18)	Translate left 18 units
1. y = F(x – 10)	
2. y = F(x) + 7	
3. y = F(x + 48)	
4. y = F(x) – 22	

Equation	Effect to Fred's graph
Example 2: y=F(x + 8)	Translate left 8 units
6. y= F(x) +29	Translate up 29 units
7. y = F(x −7)	Translate right 7
8. y= F(x+45)	Translate left 45
9. y= F(x+5)+14	Translate left 5 and up 14

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5. $y = F(x + 30) + 18$	

10. $y = F(x-6)-2$	Translate down 2 and right 6

Summary: Translations of Functions

The translations of **functions** are very similar to the transformations of **individual coordinates**. The main difference between translations in coordinate notation and translations in function notation is this:

Horizontal translations are backwards!

\+ moves left, − moves right (inside change)

Part 4: Applying This to Other Functions

1. Consider the parent graph on the right. It's notation is **H(x)** = $\sqrt{x}$, and we will call it **Harry**.

    a. Is Harry a function? ____________

    b. What are Harry's characteristic points?