**Transformations with Fred Functions- Packet 1**

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

**F(x)**

1. Let’s review briefly.
2. a. Explain what a function is in your own words.
3. Using the graph, how do we know that Fred is a function?
4. a. Explain what we mean by the term domain.

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

1. a. Explain what we mean by the term range.

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

1. Let’s explore the points on Fred.
2. How many points lie on Fred? Can you list them all?
3. What are the key points that would help us graph Fred?

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.

1. Use the graph of graph to evaluate the following.

F(1) = \_\_\_\_\_ F( –1) = \_\_\_\_\_ F(\_\_\_\_\_) = –2 F(5) = \_\_\_\_\_\_

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

Therefore the equation of Fred is **y = F(x)**.

|  |  |
| --- | --- |
| **x** | **F(x)** |
| –1 |  |
| 1 |  |
| 2 |  |
| 4 |  |

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

Now let’s try graphing Freddie Jr.: **y = F(x) + 4**. Complete the table below for this new function and then graph Freddie Jr. on the coordinate plane above.

**y = F(x) + 4**

|  |  |
| --- | --- |
| **x** | **y** |
| –1 |  |
| 1 |  |
| 2 |  |
| 4 |  |

1. What type of transformation maps Fred, F(x), to Freddie Jr., F(x) + 4? (Be specific.)
2. How did this transformation affect the x-values? *(Hint: Compare the characteristic points of Fred and Freddie Jr.)*
3. How did this transformation affect the y-values? *(Hint: Compare the characteristic points of Fred and Freddie Jr.)*
4. In y = F(x) + 4, how did the “+4” affect the graph of Fred? Did it affect the domain or the range?
5. Suppose Freddie Jr’s equation is: **y = F(x) – 3**. Complete the table below for this new function and then graph Freddie Jr. on the coordinate plane above.

**y = F(x) – 3**

|  |  |
| --- | --- |
| **x** | **y** |
| –1 |  |
| 1 |  |
| 2 |  |
| 4 |  |

1. What type of transformation maps Fred, F(x), to Freddie Jr., F(x) – 3? Be specific.
2. How did this transformation affect the x-values? *(Hint: Compare the characteristic points of Fred and Freddie Jr.)*
3. How did this transformation affect the y-values? *(Hint: Compare the characteristic points of Fred and Freddie Jr.)*
4. In y = F(x) – 3, how did the “– 3” affect the graph of Fred? Did it affect the domain or the range?
5. Checkpoint: Using the understanding you have gained so far, describe the affect to 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 |  |
| 1. y = F(x) + 73 |  |
| 1. y = F(x) + 32 |  |
| 1. y = F(x) – 521 |  |

1. Suppose Freddie Jr’s equation is: **y = F(x + 4)**.
2. Complete the table.

|  |  |  |
| --- | --- | --- |
| **x** | **x + 4** | **y** |
| –5 | –1 | 1 |
|  | 1 | –1 |
|  | 2 | –1 |
|  | 4 | –2 |

*(****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.)*

On the coordinate plane above, graph the 4 ordered pairs (x, y). The first point is (–5, 1).

1. What type of transformation maps Fred, F(x), to Freddie Jr., F(x + 4)? (Be specific.)
2. How did this transformation affect the x-values? *(Hint: Compare the characteristic points of Fred and Freddie Jr.)*
3. How did this transformation affect the y-values? *(Hint: Compare the characteristic points of Fred and Freddie Jr.)*
4. In y = F(x + 4), how did the “+4” affect the graph of Fred? Did it affect the domain or the range?
5. Suppose Freddie Jr’s equation is: **y = F(x – 3)**. Complete the table below for this new function and then graph Freddie Jr. on the coordinate plane above.
6. Complete the table.

**y = F(x – 3)**

|  |  |  |
| --- | --- | --- |
| **x** | **x – 3** | **y** |
|  | –1 |  |
|  | 1 |  |
|  | 2 |  |
|  | 4 |  |

1. On the coordinate plane above, graph the 4 ordered pairs (x, y). [*Hint: The 1st point should be (2, 1).*]
2. What type of transformation maps Fred, F(x), to Freddie Jr., F(x – 3)? (Be specific.)
3. How did this transformation affect the x-values? *(Hint: Compare the characteristic points of Fred and Freddie Jr.)*
4. How did this transformation affect the y-values? *(Hint: Compare the characteristic points of Fred and Freddie Jr.)*
5. In y = F(x – 3), how did the “ –3” affect the graph of Fred? Did it affect the domain or the range?
6. 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: y=F(x + 18) | Translate left 18 units |
| 1. y = F(x – 10) |  |
| 1. y = F(x) + 7 |  |
| 1. y = F(x + 48) |  |
| 1. y = F(x) – 22 |  |
| 1. y = F(x + 30) + 18 |  |

1. Checkpoint: Using the understanding you have gained so far, write the equation that would have the following effect on Fred’s graph.

|  |  |
| --- | --- |
| **Equation** | **Effect to Fred’s graph** |
| Example: y=F(x + 8) | Translate left 8 units |
|  | Translate up 29 units |
|  | Translate right 7 |
|  | Translate left 45 |
|  | Translate left 5 and up 14 |
|  | Translate down 2 and right 6 |

1. Now let’s look at a new function.

Its notation is **H(x)**, and we will call it **Harry**.

Use Harry to demonstrate what you have learned

so far about the transformations of functions.

1. What are Harry’s characteristic points?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Describe the effect on Harry’s graph for each

of the following.

1. H(x – 2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. H(x) + 7 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. H(x+2) – 3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Use your answers to questions 1 and 2 to help you sketch each graph *without using a table*.
5. y = H(x – 2) b. y = H(x) + 7

c. y = H(x+2) – 3