PATTERNS AND FUNCTIONS 5

Name: Key Date:_____ Period:_____

SECTION 5.4 GRAPHING FUNCTIONS

Big Idea: How do we graphically represent functions?

EXPLORATION 1: GRAPHING POINTS

To graph the following data, follow a logical process:

x-coordinate	*y*-coordinate
0	0
1	5
2	10
3	15
4	20
5	25
6	30
7	35
8	40

a. What are the inputs (domain)? What are the outputs (range)?

{0,1,2,3,4,5,6,7,8} {0,5,10,15,20,25,30,35,40}

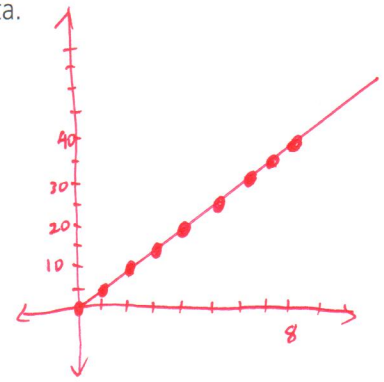
b. Based on your answer to Part (a), which quadrants are necessary for the graph? What will you graph look like? Sketch an example.

First quadrant and the origin

c. Based on your answer to Part (a), will all the points fit on a 10 x 10 graph if the scale is 1 for each axis? If not, what should each graph unit be equal to, on the horizontal axis? Of the vertical axis? Notice that the two axes need not have the same scale.

No. Horizontal axis should be scaled by 1.
Vertical axis should be scaled by 4 or 5.

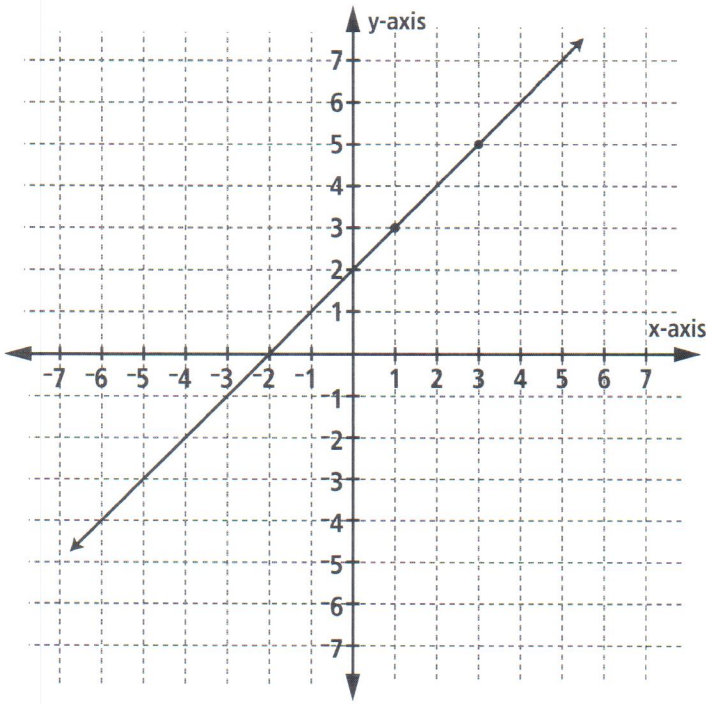
d. Now that you have carefully considered an appropriate scale for the axes, graph the points given in the data.



(the line is not part of the data. Only the 9 points should be.)

EXPLORATION 2

Consider the line below:



a. Identify the coordinates of the two labeled lattice points. Find three other lattice points that are also on the line. Make a list of all five points. How can you find more lattice points on the line without looking back at the graph?

(1, 3) and (3, 5) are on the graph. So are (-4, -2), (-2, 0) and (0, 2). (answers will vary.)

(x, x+2) is on the graph.

b. One way to organize this list is to make a table. Make a table and plot the points from your list.

x	y
-4	-2
-2	0
0	2
1	3
3	5

c. Did you put the points in your table in a certain order? Without looking at the graph, find three more points on the line using your table. Check that these points are actually on the line.

(-3, -1) (-1, 1) (2, 4)

are some examples.

d. Describe any patterns you see between the first and second coordinates of the points on this line.

The y-coordinate (second coordinate) is 2 more than the x-coordinate (first coordinate).

e. What points on the line has 40 as its first coordinate? What point has 40 as its second coordinate?

(40, 42) (38, 40)

f. If the point (x, y) is on this line, what is the relationship between x and y? Write this as an equation.

(x, y) or (x, x+2)

$y = x + 2$

GRAPHING CALCULATOR ACTIVITY:

Objective: To explore the graphing calculator as a tool to study lines. We will use the calculator to graph the lines given by the equations:

$$y = 2x + 3 \qquad y = 2x - 2 \qquad y = 2x$$

1. Turn on the calculator and press the "**y=**" button. Type in each formula using the first 3 slots. That is, the "$\mathbf{y_1}$=", "$\mathbf{y_2}$=" and "$\mathbf{y_3}$=".
2. Next, push the "**zoom**" button on the top row and use the down arrow to move the cursor to #6. Push "**enter**". Push "**graph**". You should have three graphs on your screen.
3. What do you notice about these lines? What are the similarities? What are the differences?
4. Explore these lines given by these formulas: $y = 2x + 3$, $y = x + 3$, $y = -x + 3$
   What do you notice about these lines? What are the similarities? What are the differences?
5. We will now explore the first 3 lines using the table button. Type the equations in again if you cleared them. Be sure to disable or clear the other equations.

6 First push "**2nd**" button and then the "**tableset**" button. Make sure the "**tblstart=**" slot has the value 0, which tells the table to start at 0. Next, make sure the button with a "⟺**tbl=**" has the value of 1. This will have the first coordinate column ("***x***") change by 1 unit as you move down the table.

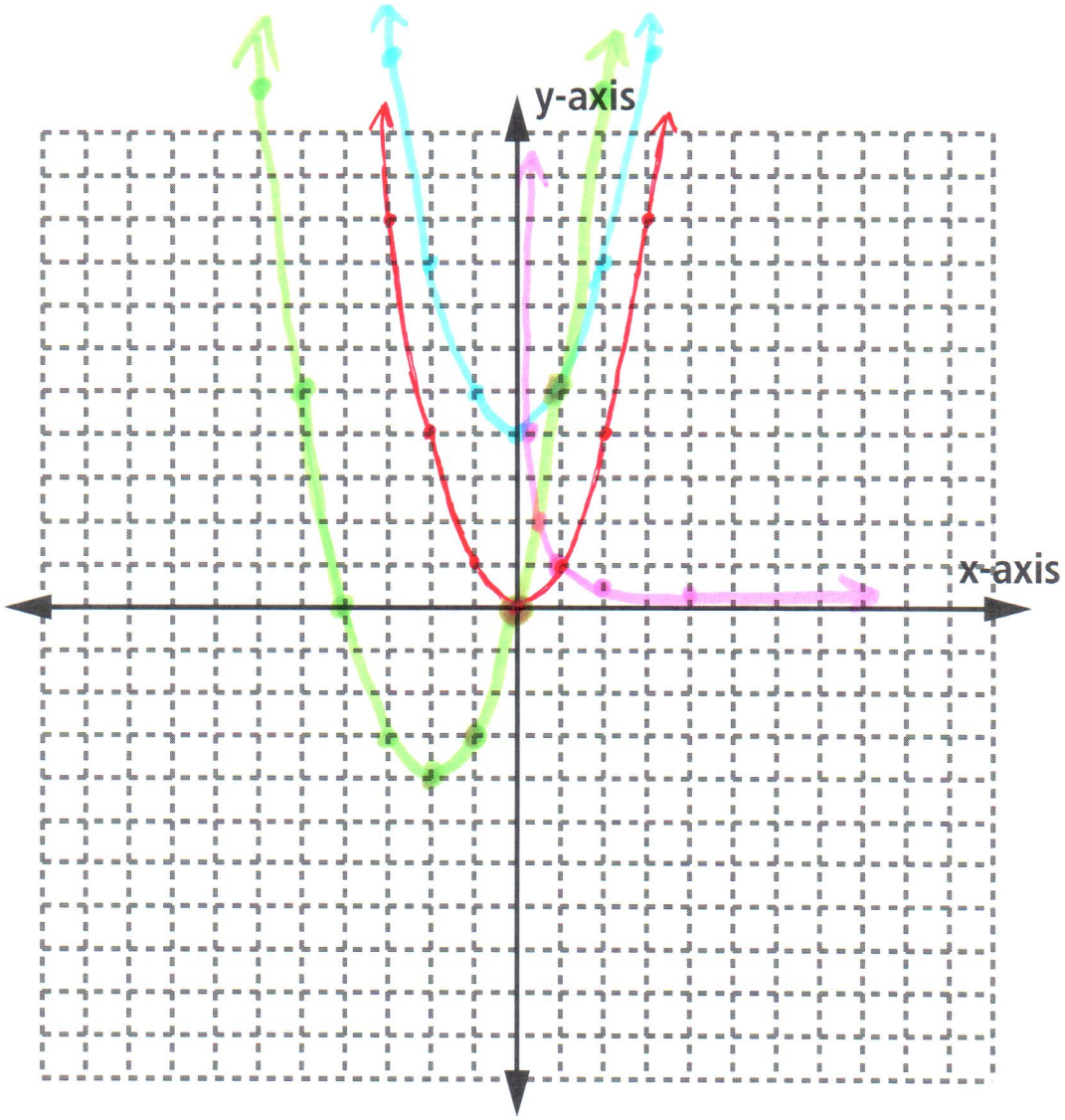
7. Next, push the "**table**" button. Notice that these are columns of numbers just like the tables we have made. The first column is called the "***x***" column and it contains the first coordinates. The other columns are labeled by "$\mathbf{y_1}$=", "$\mathbf{y_2}$=" and "$\mathbf{y_3}$=". Using this table, what similarities and differences do you notice about these lines? Compare these observations with what you noticed about their graphs. Explore the table by using the up and down arrow and the right and left arrow. Can you find the values for the line given by the equation in the "$\mathbf{y_3}$=" slot?
8. Push the "**tableset**" button again. Type in the number 0 in the "**tblstart=**" slot. Now change the "⟺**tbl**" to **0.5** so that the first coordinates will change by only as we move up or down the "***x***" column.
9. Explore the tables if you push the "**tableset**" button and reset the "⟺ **tbl=**" to **0.1**

3. They are parallel (sloped the same way) but at different "heights."
4. They have different slopes (or steepnesses), but all pass through (0, 3).
7. Each y-value increases by 2 when x increases by 1.

10. Explore these more complex functions that produce different kinds of curves.

$$y_1 = x^2,\ y_2 = x^2 + 4,\ y_3 = x^2 + 4x,\ y_4 = \frac{1}{x}$$

Use a graphing calculator to graph for y_1, y_2, y_3, y_4 and sketch what you see on the coordinate system below.



SUMMARY (What I learned today)