Name Key Date _____

Math 8R Period _____

Comparing Functions

Two functions can be compared even if they are represented in different ways. To compare the function, regardless of whether they are represented algebraically, graphically, verbally, or numerically in a table, determine the **rate of change** and **initial value** for each function.

Slope (m) y-intercept (b)

- **Example 1:** Compare functions A and B by their rates of change and initial values.

Function A is represented by the following table:

x	y
-9	-10
-6	-6
-3	-2
3	6
6	10

(-9, -10) (-6, -6)

m R.O.C. = $\frac{4}{3} = 1.333\overline{3}$

b I.V. = 2

$m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \frac{-6-(-10)}{-6-(-9)}$

$m = \frac{4}{3}$

Function B is represented by the following equation:

$y = mx + b$

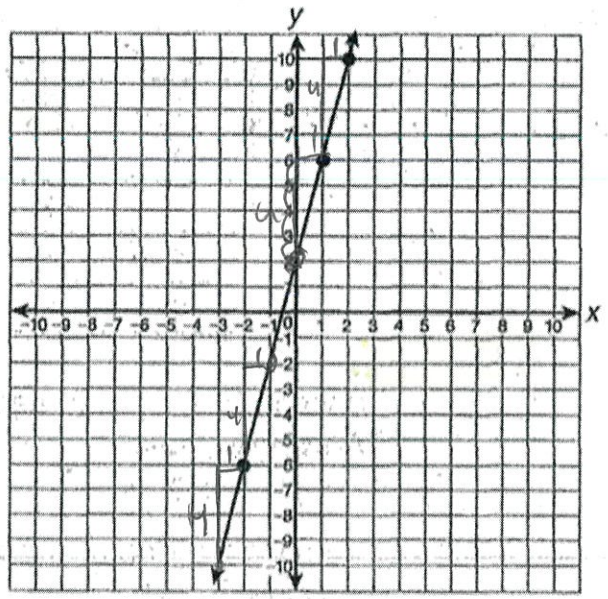
$y = \frac{3}{4}x + 2$

m R.O.C. = $\frac{3}{4} = .75$

b I.V. = 2

Because $\frac{4}{3} > \frac{3}{4}$, the rate of change for Function A is greater than the rate of change for Function B. Because 2 = 2, the initial values for both functions are the same.

➢ **Example 2:** Compare functions C and D by their rates of change and initial values.

Function C is represented by the following description:	Function D is represented by the following graph:
The value of y is equal to the product of x and 2 plus 4. Equation: $y = 2x + 4$ $y = mx + b$ slope (m) R.O.C. = 2 I.V. = 4 y-int (b)	 m R.O.C. = $\frac{rise}{run}$ = 4 b I.V. = 2 $m = \frac{rise}{run}$ $m = \frac{4}{1}$ $m = 4$

Because $4 > 2$, the rate of change for Function D is greater than the rate of change for Function C. Because $2 < 4$, the initial value for Function D is less than the initial value for Function C.

Practice: For questions 1 through 3, compare the rates of change and the initial values for the functions.

1.

Function E is represented by the following description:

The value of y is equal to the sum of x and -5.

Equation: $y = x - 5$

$y = mx + b$

m → slope

R.O.C. = 1

b → y-int

I.V. = -5

Function F is represented by the following table:

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

R.O.C. = $\frac{1}{2}$

I.V. = 2.5 or $\frac{5}{2}$ or 2.5

$y = mx + b$

$m = \frac{1}{2}$

$B =$

$(-5, 0)\ (-3, 1)$

$x_1\ y_1\ x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{1 - 0}{-3 - (-5)}$

$m = \frac{1}{2}$

$(-5, 0)\ m = \frac{1}{2}$

$y = mx + b$

$0 = \frac{1}{2}(-5) + b$

$0 = -\frac{5}{2} + b$

$+\frac{5}{2}\quad +\frac{5}{2}$

$\frac{5}{2} = b$

$\frac{5}{2} = 2.5$

Which statement correctly compares the properties of functions E and F?

a) Function E has a greater rate of change and a greater initial value than function F.

b) Function E has a greater rate of change and a smaller initial value than function F.

c) Function F has a greater rate of change and a greater initial value than function E.

d) Function F has a greater rate of change and a smaller initial value than function E.

$1 > \frac{1}{2}$

$-5 < 2.5$

2.

Function G is represented by the following table:

x	y
-4	12
-2	7
2	-3
4	-8
6	-13

m R.O.C. = $-\frac{5}{2} = -2.5$

b I.V. = 2

$y = mx + b$

$m = -\frac{5}{2}$

$b = 2$

$(-4, 12)(-2, 7)$

$x_1\ y_1\ \ x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{7 - 12}{-2 - (-4)}$

$m = \frac{-5}{2} = -2.5$

$(-4, 12)\ \ m = -\frac{5}{2}$

$x\ y$

$y = mx + b$

$12 = -\frac{5}{2}(-4) + b$

$12 = 10 + b$

$-10\ \ -10$

$2 = b$

Function H is represented by the following equation:

$y = mx + b$

$y = 2.5x - 2$

m R.O.C. = 2.5

b I.V. = -2

Compare the rates of change for functions G and H.

Functia G has a smaller rate of change than Functia H $-2.5 < 2.5$

Compare the initial values for functions G and H.

Functia G has a larger initial value than Functia H. $2 > -2$

3.

Function J is represented by the following table:

x	y
-9	1
-3	3
3	5
6	6

m R.O.C. = $\frac{1}{3} = .3$

b I.V. = 4

$y = mx + b$

$m = \frac{1}{3}$

$b = 4$

$(-9, 1)$ $(-3, 3)$

$x_1\ y_1$ $x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{3-1}{-3-(-9)}$

$m = \frac{2}{6}$

$m = \frac{1}{3}$

$(-9, 1)$ $m = \frac{1}{3}$

$x\ y$

$y = mx + b$

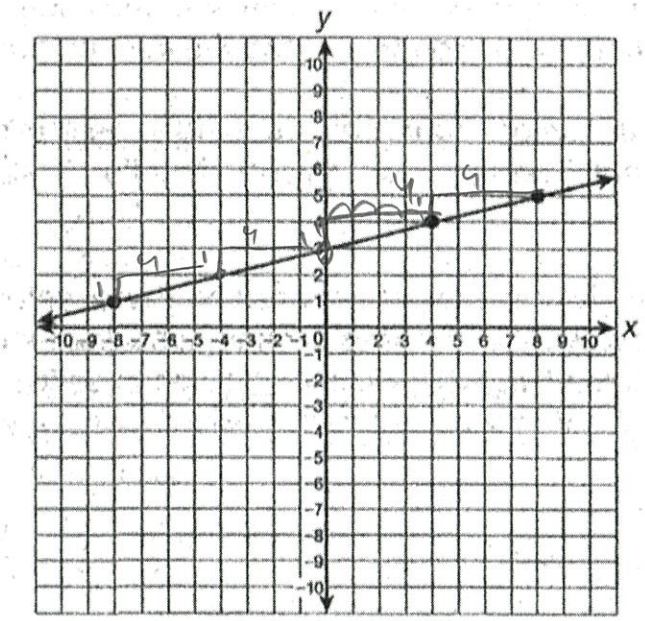
$1 = \frac{1}{3}(-9) + b$

$1 = -3 + b$

$+3 \quad +3$

$4 = b$

Function K is represented by the following graph:



m R.O.C. = $\frac{1}{4} = .25$

b I.V. = 3

$m = \frac{\text{rise}}{\text{run}}$

$m = \frac{1}{4}$

Compare the rates of change for functions J and K.

Function J has a greater rate of change than Function K.

$\frac{1}{3} > \frac{1}{4}$

Compare the initial values for functions J and K.

Function J has a greater initial value than Function K

$4 > 3$

Explain how you were able to determine the rates of change for each function.

Function J: I used the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ + got $\frac{1}{3}$

Function K: I used $\frac{\text{rise}}{\text{run}}$ + got $\frac{1}{4}$