6.5 Name_____

Properties of Linear Functions

Rather than simply comparing graphs of two functions in the same family, we can also compare functions expressed in different ways.

Ex. 1: Let's find out key information about the functions below, so that we can compare them:

x	f(x)
2	2
3	5
4	8
5	11

$f(x) = 3x - 4$

Domain: All real number such that $2 \le x \le 5$ includes decimals!

What is initial value for f(x)? 2

What is the final value of f(x)? 11

What is the range of f(x)? $2 \le f(x) \le 11$

What is the slope of f(x)? 3

x	g(x)
2	$3\frac{1}{3}$
3	4
4	$4\frac{2}{3}$
5	$5\frac{1}{3}$

$g(x) = \frac{2}{3}x + 2$

Domain: All real numbers such that $2 \le x \le 5$

What is initial value for g(x)? $3\frac{1}{3}$

What is the final value of g(x)? $5\frac{1}{3}$

What is the range of g(x)? $3\frac{1}{3} \le g(x) \le 5\frac{1}{3}$

What is the slope of g(x)? $\frac{2}{3}$

Now, compare f(x) and g(x)...

Compare the initial values: The initial value of f(x) is 2, which is less than the initial value of g(x), $3\frac{1}{3}$

Compare the range: The range of f(x) is $2 \le f(x) \le 11$, while the range of g(x) is $3\frac{1}{3} \le g(x) \le 5\frac{1}{3}$

Compare the slopes: The slope of f(x) is 3, which is more than the slope of g(x), $\frac{2}{3}$

Ex. 2: f(x) is defined by the function $f(x) = 2x + 9$ and has a domain of all real numbers such that $-4 \le x \le -1$. The table show some ordered pairs of g(x), which has the same domain as f(x).

x	g(x)
-4	10
-3	9
-2	8
-1	7

Compare the initial value, range, and rate of change of f(x) and g(x).

$f(-4) = 2(-4) + 9$
$= -8 + 9$
$= 1 \rightarrow$ initial value

$f(-1) = 2(-1) + 9$
$= -2 + 9$
$= 7 \rightarrow$ ending value

Range: $1 \le f(x) \le 7$ $7 \le g(x) \le 10$

Rate of change: f(x): 2

g(x): $\frac{9-10}{-3+4} = \frac{-1}{1} = -1$

g(x): -1

In order to compare properties of linear functions given a graph and a description, it is often helpful to write a rule for the functions.

Ex. 3: One group of hikers hiked at a steady rate of 6.5 km per hour for 4 hours. The graph shows the distance a second group of hikers hiked in kilometers.

Write a function to represent each, then compare the initial value, domain, range, and slopes of each.

$f(x) = 6.5x$

$D: 0 \le x \le 4$

$f(0) = 6.5(0) = 0$

$f(4) = 6.5(4) = 26$

$R: 0 \le f(x) \le 26$

$m = 6.5$

$g(x)$: $\frac{36-0}{4.5-0} = 8$

$g(x) = 8x$

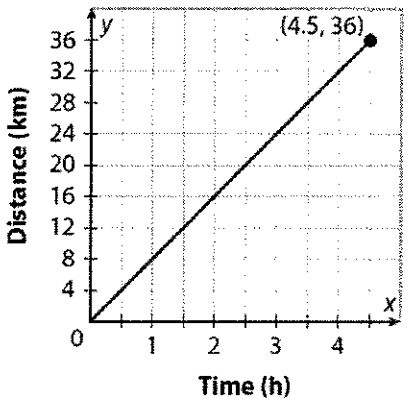
$D: 0 \le x \le 4.5$

$g(0) = 8(0) = 0$

$g(4.5) = 36$

$R: 0 \le g(x) \le 36$

$m = 8$



*initial values same.
Group 1 slope > group 2 slope
Group 1 goes further than group 2.

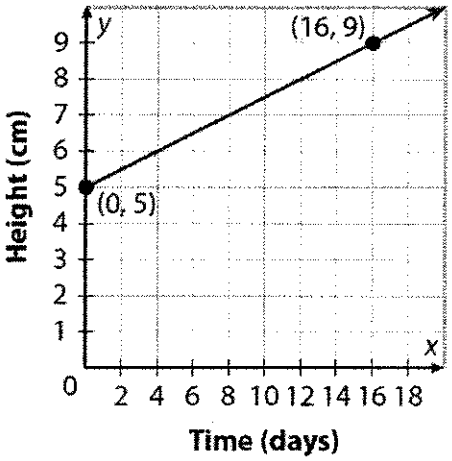
Ex.4: An experiment compares the heights of two plants over time. Plant A was 5 cm tall at the beginning and grew 0.3 cm each day. The graph shows the height of plant B in centiments, as a function of t days.

Compare the rates of change and initial values for each.

$A(x) = .3x + 5$ $B(x) = .25x + 5$

initial values are both 5

rate of change for A > rate of change for B.



Ex. 5 Compare the domain, range, and rates of change of f(x) and g(x). Assume both functions are continuous.

f(x):

$D: -1 \le x \le 3$

$R: -7 \le f(x) \le 5$

$m = \frac{-4+7}{0+1} = 3$

g(x)

$D: -1 \le x \le 3$ Same!

$R: -4 \le g(x) \le 4$

$m = 2$

Rate of change of f(x) > rate of change for B

x	f(x)
−1	−7
0	−4
1	−1
2	2
3	5