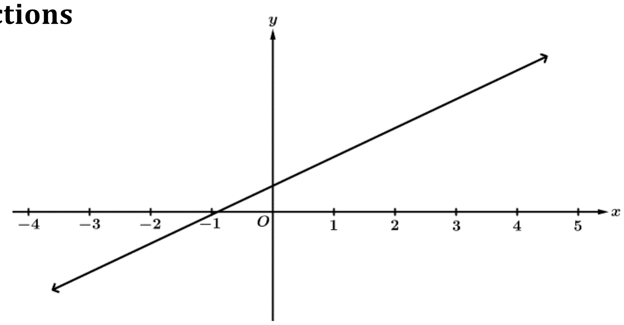
Linear Functions

For any linear function, the average rate of change over any length input – value interval is constant.

Note: We often think of this as the __________ of the line.



x	$f(x)$
1	4
2	7
4	10
8	13

Example 1: The table above gives selected values of the function $f(x)$. Explain why $f(x)$ is not a linear function.

Example 2: Consider the quadratic function $g(x) = x^2$. Complete the table of values for $g(x)$ over the consecutive equal length input value intervals below. Then complete the table for the average rates of change of $g(x)$ for each consecutive interval of equal length input values.

x	$g(x)$
-3	
-1	
1	
3	
5	

Interval	Avg. rate of change
$[-3, -1]$	
$[-1, 1]$	
$[1, 3]$	
$[3, 5]$	

What do you notice about the average rates of change of $g(x)$ over consecutive equal length input intervals?

Example 3: Selected values of various functions are given in the tables below. For each table, determine if the function could be linear, quadratic, or neither.

a)

x	$f(x)$
1	0
2	1
3	4
4	9

b)

x	$g(x)$
1	0
2	1
5	4
10	9

c)

x	$h(x)$
1	-1
3	1
5	2
7	2

More On Concavity

Concave Up: The average rate of change over equal length input value intervals is ______________________ for all small length intervals.

Concave Down: The average rate of change over equal length input value intervals is _____________________ for all small length intervals.

Example 4: Selected values of the functions k, m, and p are given in the tables below. For each function, determine if the function could be concave up, concave down, or neither over its domain.

a)

x	$k(x)$
1	4
1.1	1
1.2	-1
1.3	-2

b)

x	$m(x)$
1	1
1.1	4
1.2	7
1.3	10

c)

x	$p(x)$
1	1
1.1	7
1.2	11
1.3	13