Average Rate of Change

- Linear functions have a constant rate of change called the slope of the line. We only find slope for linear functions. The slope of a line does not change no matter where you find it on the line.

What do we do for other types of functions?

- Find the average rate of change in a specific interval. (It will change for each different interval!)

The **average rate of change** between any two points $(x_1,f(x_1))$ and $(x_2,f(x_2))$ is the change of y over the change in x at th **two endpoints of the interval.** Average rate of change describes on average how a function is changing over an interval.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad becomes \quad \frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

Find the **slope** from an equation, a table, and a graph.

Equation

$y = 5x + 10$

5

Table

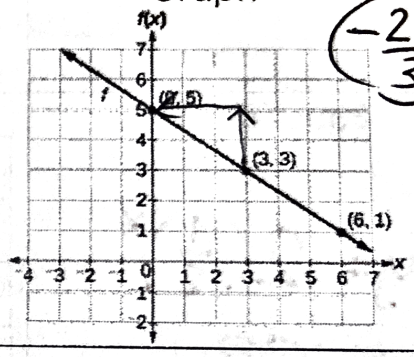
x	f(x)
-2	6
0	12
2	18
4	24
6	30

×2 +6 ×2 +6 ×2 +6 ×2 +6

$\frac{6}{2}$

3

Graph



$-\frac{2}{3}$

Find the **average rate of change on an interval** from an equation, a table, and a graph.

Equation

$f(x) = 3(2)^x$

Find the average rate of change on the interval $0 \le x \le 2$

(0, 3) (2, 12)

$\frac{12-3}{2-0} = \frac{9}{2}$ as a decimal

Find the average rate of change on the interval $3 \le x \le 5$

(3, 24) (5, 96)

$\frac{96-24}{5-3} = \frac{72}{2} = 36$

Why were they not the same?

Because it is not linear

Table

x	f(x)
0	1
1	3
2	9
3	27
4	81

Find the average rate of change on the interval $0 \le x \le 2$

(0, 1) (2, 9)

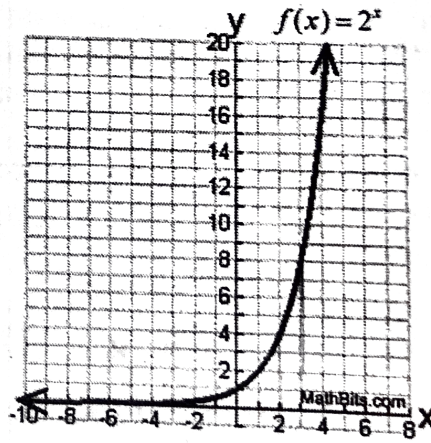
$\frac{9-1}{2-0} = \frac{8}{2} = 4$

Find the average rate of change on the interval $2 \le x \le 4$

(2, 9) (4, 81)

$\frac{81-9}{4-2} = \frac{72}{2}$ 36

Graph



Find the average rate of change the interval $0 \le x \le 3$

(0, 1) (3, 8)

$\frac{8-1}{3-0} = \frac{7}{3}$