

Average Rate of Change (AROC)/Slope Notes

Today's Question: How do we find the rate of change of a function?

Rate of Change

- ⊙ The rate of change is the ratio of the change of one quantity to a change in another quantity.
- ⊙ Positive ~ increasing ↗
- ⊙ Negative ~ decreasing ↘
- ⊙ Which function has a constant rate of change? horizontal line / linear
- ⊙ Horizontal Lines ~ zero →
- ⊙ Vertical Lines ~ undefined ↑

Constant Rate of Change

The slope of a non-vertical line is the ratio of the vertical (change in y) to the horizontal (change in x) between any two points on the line.

$$m = \frac{\text{change in } y}{\text{change in } x} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

Example 1: Find the slope between $(2, 4)$ and $(4, 8)$.

$$\frac{8-4}{4-2} = \frac{4}{2} = 2 = 2$$

Example 2: The table shows the amount of water evaporating from a swimming pool on a hot day. Find the rate of change between 2 hours and 6 hours.

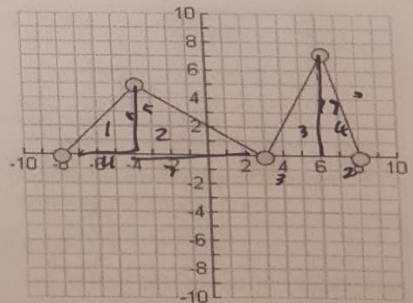
Time (hours)	2	6	12
Gallons evaporated	4.5	13.5	27

$$\frac{13.5 - 4.5}{6 - 2} = \frac{9}{4}$$

Example 3: Find all rates of change between the points, then determine which has the greatest rate of change?
the steeper the line, the greater the slope

What is the value?

$$\frac{7}{2}$$



Example 4: Find the rate of change for the equation: $3x - 6y = 18$

$$\begin{aligned} 3x - 6y &= 18 \\ -6y &= -3x + 18 \\ \frac{-6y}{-6} &= \frac{-3x + 18}{-6} \\ y &= \frac{1}{2}x - 3 \end{aligned}$$

Rate of Change Practice

1. Calculate the rate of change from the table.

a.

x	y
3	27
5	45
7	63
9	81

18

$\frac{18}{2} = 9$

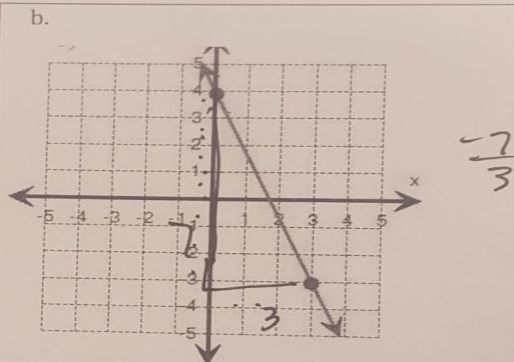
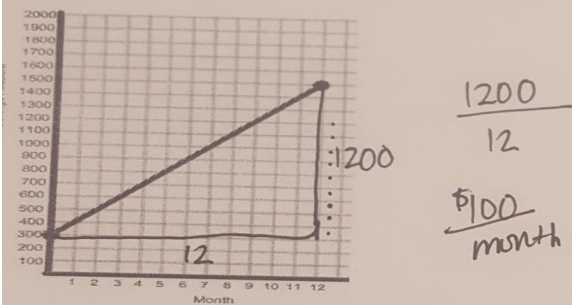
b.

x	y
-10	50
-2	10
4	-20
14	-70

-40

$\frac{-40}{8} = -5$

Calculate the rate of change from the graph.



Calculate the rate of change from the equations.

a. $y = -4x + 6$

-4

b. $y = -3/4x - 9$

-3/4

a. $4x - 2y = 8$

$4x \quad -4x$

$-2y = -4x + 8$

$2y = 2x - 4$

b. $7x + 2y = 14$

$-7x \quad -7x$

$2y = 7x + 14$

$y = \frac{7}{2}x + 7$

Calculate the rate of change from two points.

a. $(-3, 5)$ and $(2, -4)$

$x_1 \ y_1 \quad x_2 \ y_2$

$\frac{-4 - 5}{2 - (-3)} = \frac{-9}{5}$

b. $(5, 8)$ and $(10, 12)$

$x_1 \ y_1 \quad x_2 \ y_2$

$\frac{12 - 8}{10 - 5} = \frac{4}{5}$

Calculate the rate of change from word problems.

A teacher weighed 145 lbs in 1986 and weighs 190 lbs in 2007. What was the rate of change in weight?

~~200~~

$\frac{190 - 145}{2007 - 1986}$

$\frac{45 \text{ lbs}}{21 \text{ years}}$

b. The landscaper charges \$550 for the shrubs and plants used for the building of the new lawn. He also charges \$35 per hour.

$y = 35x + 550$