

# Average Rate of Change & Secant Line

$$\text{Average Rate of Change} = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{f(x_1) - f(x_2)}{x_1 - x_2}$$

Average Rate of Change is a single number indicating a rough amount computed for some measurable entity that changes or varies with time.

A **Secant Line**, also simply called a secant, is a line passing through two points of a curve.

Therefore **slope of a secant line** is the same as the Average Rate of Change.

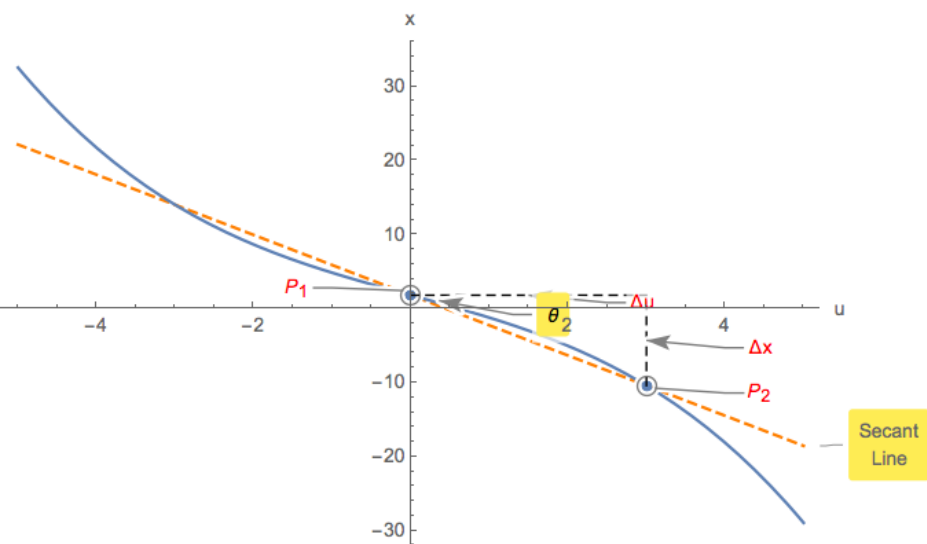
Equation for Secant Line, if **A** indicates Average Rate of Change while **f(x)** indicates horizontal axis value for secant line computes as follows:

$$A = \frac{f(x) - f(x_1)}{x - x_1} \Rightarrow A(x - x_1) = f(x) - f(x_1) \Rightarrow A(x - x_1) + f(x_1) = f(x)$$

$$f(x) = Ax + (f(x_1) - Ax_1)$$

## Example 1.

$$x = -\frac{13u^3}{100} - \frac{29u}{10} + \frac{9}{5} \text{ average between } 0, 3$$



$$\Delta x = x(3) - x(0) = -\frac{13(3)^3}{100} - \frac{29(3)}{10} + \frac{9}{5} - \left( -\frac{13(0)^3}{100} - \frac{29(0)}{10} + \frac{9}{5} \right) = -\frac{1221}{100}$$

$$\text{Secant Slope} = \tan(\theta) = \frac{x(3) - x(0)}{3 - 0} = -\frac{407}{100}$$

$$\text{Average Rate of Change} = A = -\frac{407}{100}$$

$$\text{Secant Line: } x = -\frac{407}{100}u + \frac{9}{5}$$

x could be temperature of a cup of tea and u time.

x could be speed of a car and u time.

x could be gasoline amount and u distance traveled.