

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

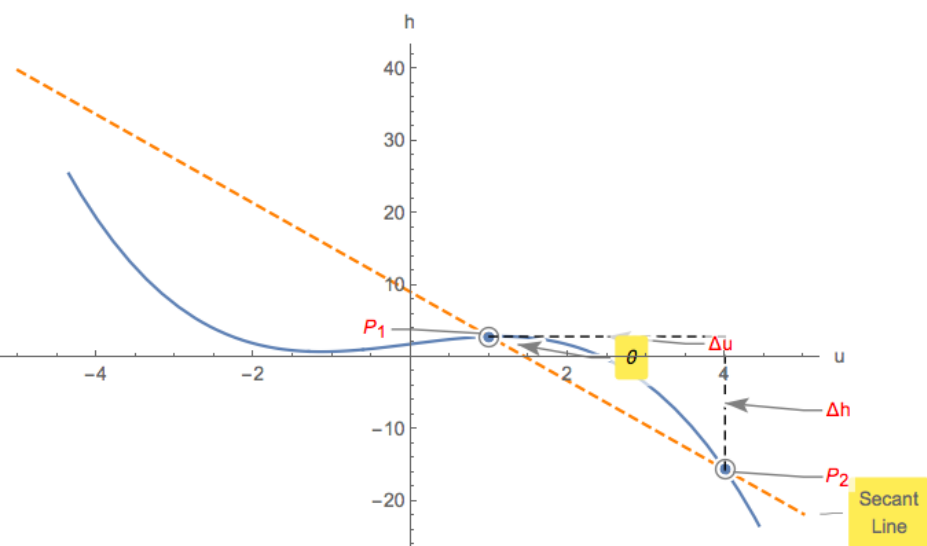
computes as follows:

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

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

Example 1.

$$h = -\frac{9u^3}{25} + \frac{7u}{5} + \frac{9}{5} \text{ average between } 1, 4$$



$$\Delta h = h(4) - h(1) = -\frac{9(4)^3}{25} + \frac{7(4)}{5} + \frac{9}{5} - \left(-\frac{9(1)^3}{25} + \frac{7(1)}{5} + \frac{9}{5} \right) = -\frac{462}{25}$$

$$\text{Secant Slope} = \tan(\theta) = \frac{h(4) - h(1)}{4 - 1} = -\frac{154}{25}$$

$$\text{Average Rate of Change} = A = -\frac{154}{25}$$

$$\text{Secant Line: } h = -\frac{154}{25}u + 9$$

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

h could be speed of a car and u time.

h could be gasoline amount and u distance traveled.