Average Rate of Change & Secant Line

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

Average Rate of Change is a single number indicating a rough amount computed for some measurablte 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:
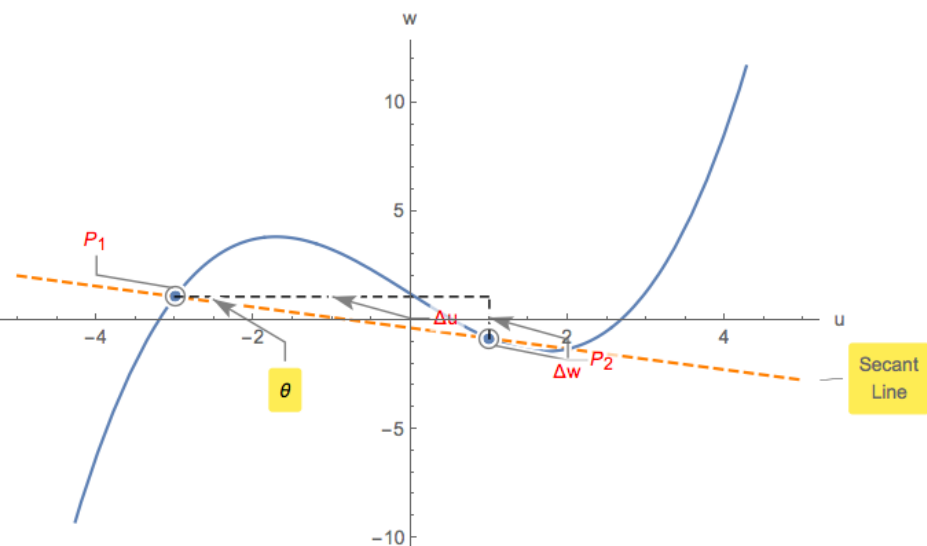
$A = \dfrac{f(x) - f(x_1)}{x - x_1} \Longrightarrow A(x - x_1) = f(x) - f(x_1) \Longrightarrow A(x - x_1) + f(x_1) = f(x)$

$$\boxed{f(x) = Ax + (f(x_1) - Ax_1)}$$

Example 1.

$w = \dfrac{13\,u^3}{50} - \dfrac{23\,u}{10} + \dfrac{6}{5}$ average between −3, 1

$\Delta w = w(1) - w(-3) = \dfrac{13\,(1)^3}{50} - \dfrac{23\,(1)}{10} + \dfrac{6}{5} - \left(\dfrac{13\,(-3)^3}{50} - \dfrac{23\,(-3)}{10} + \dfrac{6}{5} \right) = -\dfrac{48}{25}$

Secant Slope $= \text{Tan}(\theta) = \dfrac{w(1) - w(-3)}{1 - (-3)} = -\dfrac{12}{25}$

Average Rate of Change $= A = -\dfrac{12}{25}$

Secant Line: $w = \boxed{-\dfrac{12}{25}}\,u + \left(-\dfrac{9}{25} \right)$

w could be temperature of a cup of tea and u time.
w could be speed of a car and u time.
w could be gasoline amount and u distance traveled.