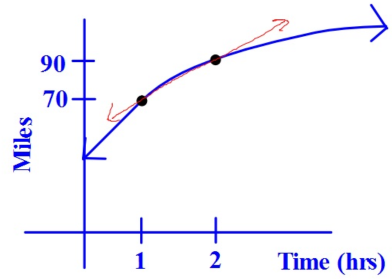
Section 2.4 Rates of Change & Tangent Lines

Average Rate of Change: $\frac{f(b)-f(a)}{b-a}$ Secant line slope over an interval of time

Instantaneous rate of change: $\lim_{h\to 0} \frac{f(x+h)-f(x)}{(x+h)-x}$ tangent line slope at a specific time

Writing equations of tangent/normal lines:

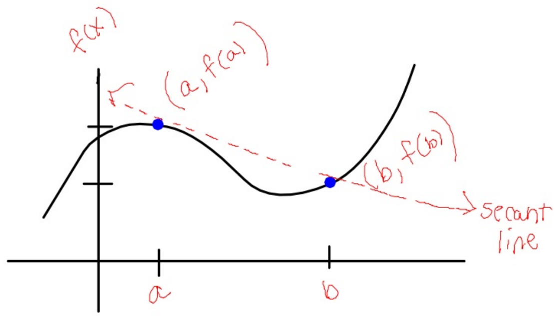


These all mean rate of change:

- slope
- $\frac{\text{rise}}{\text{run}}$
- m
- derivative
- velocity
- $\frac{\Delta y}{\Delta x}$
- $\frac{\Delta f}{\Delta x}$
- $\frac{y_2-y_1}{x_2-x_1}$

Average rate of change

$\frac{90-70 \text{ miles}}{2-1 \text{ hrs}} = 20 \frac{\text{miles}}{\text{hr.}}$



Average Rate of Change

$\frac{f(b)-f(a)}{b-a}$

Find the average rate of change over the interval.

1) $f(x)=\sqrt{4x+1}$ $\quad [\overset{a}{0},\overset{b}{2}]$

$\frac{f(b)-f(a)}{b-a}$

$m = \frac{f(2)-f(0)}{2-0}$

$m = \frac{\sqrt{4(2)+1} - \sqrt{4(0)+1}}{2-0}$

$m = \frac{3-1}{2}$

$m = 1$

2) $f(x)=2+\cos x$ $\quad [0,\pi]$

$m = \frac{f(\pi)-f(0)}{\pi - 0}$

$m = \frac{2+\cos(\pi) - [2+\cos(0)]}{\pi}$

$m = \frac{2+-1-2-1}{\pi}$

$m = \frac{-2}{\pi}$

3) $f(x)=x^2-x-6$ $\quad [0,4]$

$m = \frac{f(4)-f(0)}{4-0}$

$m = \frac{[4^2-4-6]-[0^2-0-6]}{4}$

$m = \frac{6+6}{4} = 3$