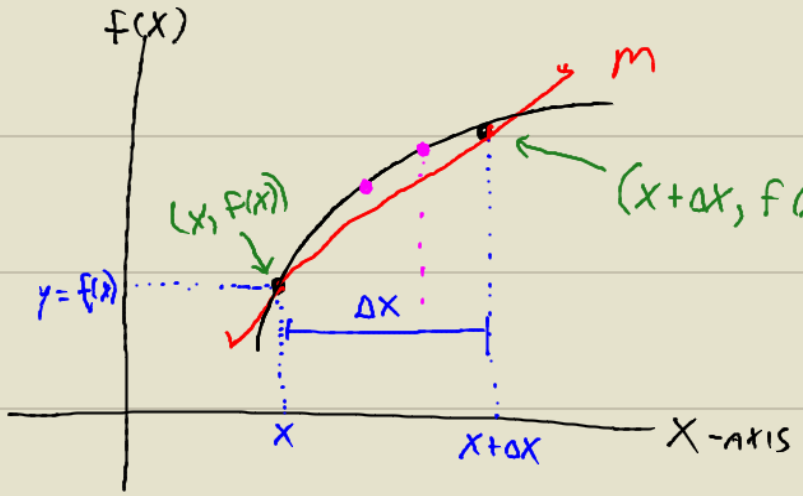

$$m_{SEC} = \frac{\text{CHANGE IN } y}{\text{CHANGE IN } x}$$

$$m_{SEC} = \frac{f(x+\Delta x) - f(x)}{x+\Delta x - x}$$

$$m_{SEC} = \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

LIMIT DEFINITION – DERIVATIVES

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

1. $f(x) = 9x + 2$

① IDENTIFY $f(x)$

$f(x) = 9x+2$

② FIND $f(x+\Delta x)$

$f(x+\Delta x) = 9(x+\Delta x) + 2$

$= 9x + 9\Delta x + 2$

③ PLUG IN $f(x)$ AND $f(x+\Delta x)$ INTO OUR FORMULA AND FIND LIMIT

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{9x + 9\Delta x + 2 - (9x+2)}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{9x + 9\Delta x + 2 - 9x - 2}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{9\Delta x}{\Delta x}$$

$$= \lim_{\Delta x \to 0} 9$$

$$f'(x) = 9$$