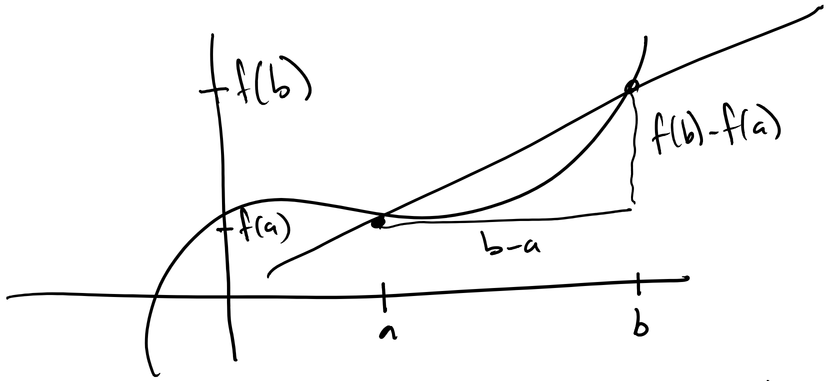
Lecture 5: Secant lines, tangent lines

Monday, January 23, 2017 12:25 PM

Slope of secant line for f(x) between $x=a$ & $x=b$



slope $= \dfrac{f(b)-f(a)}{b-a}$

= average rate of change

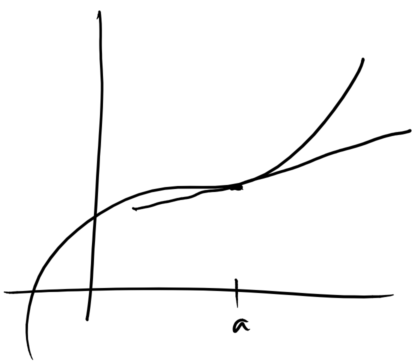
= average rate of change of f(x) between $x=a$ & $x=b$

Slope of tangent line to f(x) at $x=a$ =

instantaneous rate of change of f(x) at $x=a$ =

the derivative of f(x) at $x=a$ =

$$\lim_{h\to 0} \frac{f(a+h)-f(a)}{h} = f'(a) = \left.\frac{df}{dx}\right|_{x=a}$$



$y=f(x)$ $\quad = \left.\dfrac{dy}{dx}\right|_{x=a}$

$$\lim_{x\to 0} \frac{\sin x}{x} = 1$$

$$\lim_{x\to 0} \frac{\sin 2x}{x} = \lim_{x\to 0} \left(\frac{\sin 2x}{x}\right)\cdot\left(\frac{2}{2}\right) = \lim_{x\to 0} 2\,\frac{\sin 2x}{2x}$$

$$= 2 \lim_{x\to 0} \frac{\sin 2x}{2x}$$ as x gets close to 0

so does $2x$!

$$= 2 \lim_{u \to 0} \frac{\sin u}{u}$$ declare $u = 2x$

$$= 2 \cdot 1 = 2.$$

$$\lim_{x \to 0} \left(\frac{1 - \cos x}{x} \right) \left(\frac{1 + \cos x}{1 + \cos x} \right)$$