Calc AB

Lesson 44

9/25/15

Agenda: 9/25/15

HW leader:

Lesson 44

More chain rule

Alternate def of derivative

Period 3

Me

Period 4

Me

Chain Rule: $\frac{d}{dx}(f(g(x))) = f'(g(x)) \cdot g'(x)$

or $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$

Ex 44.3 If $y = \sin t$ and $t = \frac{1}{\sqrt{z}}$ find $\frac{dy}{dz}$

$$\frac{dy}{dz} = \frac{dy}{dt} \cdot \frac{dt}{dz} \qquad \frac{dy}{dt} = \cos t \qquad \frac{dt}{dz} = -\frac{1}{2} z^{-3/2}$$

$$\frac{dy}{dz} = \cos(t) \cdot \left(-\frac{1}{2} z^{-3/2}\right) = \boxed{-\frac{1}{2} z^{-3/2} \cos\left(z^{-1/2}\right)}$$

Ex. Find dw if $w = \ln|\sin(x^2+2)|$

$$dw = d\left(\ln|\sin(x^2+2)|\right) = \frac{1}{\sin(x^2+2)} \cdot d\left(\sin(x^2+2)\right)$$

$$= \frac{\cos(x^2+2)}{\sin(x^2+2)} \cdot d(x^2+2)$$

$$= \frac{\cos(x^2+2)}{\sin(x^2+2)} (2x) \cdot dx$$

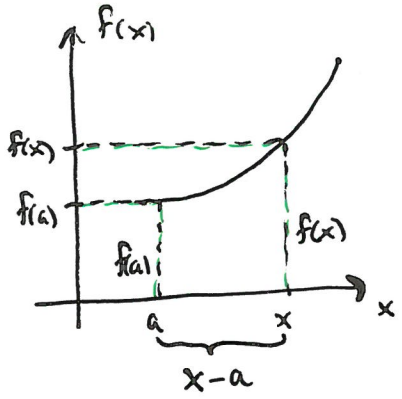
$$= \boxed{2x \cot(x^2+2)\, dx}$$

Calc AB

Lesson 44

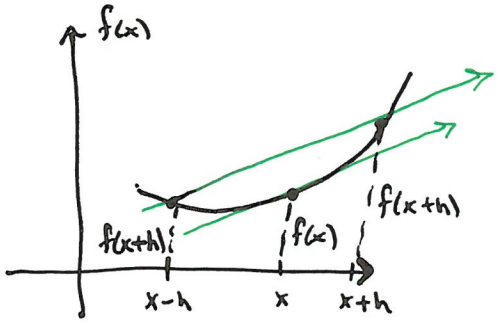
9/25/15

Alternate definitions of the Derivative:



$$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

Symmetric Derivative



$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x-h)}{2h}$$

Ex 44.4 Use the alternate def to find $f'(a)$ where $f(x) = x^2 + 1$.

$$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a} = \lim_{x \to a} \frac{(x^2+1) - (a^2+1)}{x - a}$$

$$= \lim_{x \to a} \frac{x^2 - a^2}{x - a}$$

$$= \lim_{x \to a} \frac{(x-a)(x+a)}{x-a}$$

$$= \lim_{x \to a} (x + a)$$

$$= \boxed{2a}$$

Your Turn: Do # 4,5 on HW