Derivatives

Inventory → • a derivative is

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

• $\frac{d}{dx} x^n = n \cdot x^{n-1}$

• $\frac{d}{dx} cx = c$

where c is a number

$\frac{d}{dx} \cot(x) = \csc^2$

• $\frac{d}{dx} \sin(x) = \cos(x)$

$\frac{d}{dx} \cos(x) = -\sin(x)$

$\frac{d}{dx} \tan(x) = \sec^2(x)$

ex/ $y = \tan(3x^2)$

$\frac{dy}{dx} = \sec^2(3x^2) 6x$

$6x \cdot \sec^2(3x^2)$

ex/ $y = (4x+3)^4$

$y' = 4(4x+3)^3 \cdot 4$

$16(4x+3)^3$

$\frac{d}{dx}\left[f(x) \cdot g(x)\right] = f'(x) \cdot g(x) + f(x) \cdot g'(x)$

(Product rule)

$f'g + fg'$

ex/ $\frac{d}{dx} \underbrace{x}_{f} \cdot \underbrace{\sin(2x)}_{g}$

chain rule

$1 \cdot \sin(2x) + x \cdot \cos(2x) \cdot 2$

$\sin(2x) + 2x \cdot \cos(2x)$

$$\frac{d}{dx} \frac{f(x)}{g(x)} = \frac{f'g - fg'}{g^2}$$

$\frac{d}{dx} \cot(x) = -\csc^2(x)$

$\frac{d}{dx} \sec(x) = \sec(x) \cdot \tan(x)$

$\frac{d}{dx} \csc(x) = -\csc(x) \cot(x)$

New

$y = e^x$

$y' = e^x$

$y = \ln(x)$

$y' = \frac{1}{x}$

e^x and $\ln(x)$

next class

test on Mon