Calc 1 Lecture. 10

[redacted]

Today: Trigonometric Functions 3.5 [redacted]

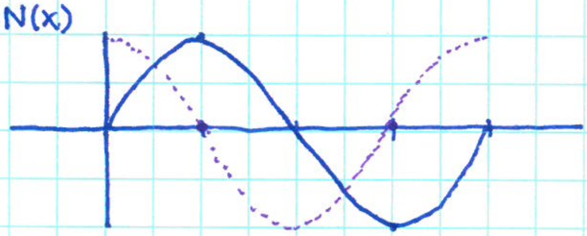
When dealing w/ Trigonometric Functions: USE RADIANS!

The Rules:

$$\boxed{\begin{aligned} \frac{d}{dx}(\sin x) &= \cos x \\ \frac{d}{dx}(\cos x) &= -\sin x \end{aligned}}$$

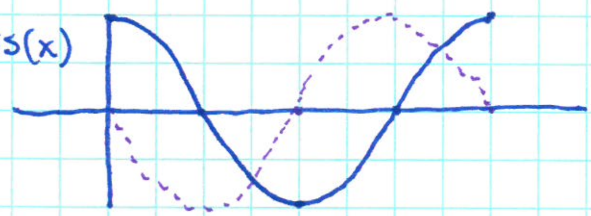
Does this make sense?

SIN(x)



Draw the derivatives!
YES it makes sence.

cos(x)



We could also plud # into a calculator and see that this is true.

Ex $f(\theta) = 4\sin(2\theta)$ need sin(x) rule and chain rule

$$\frac{df}{d\theta} = 4\cos(2\theta)\cdot\frac{d}{d\theta}2\theta$$
$$= 8\cos(2\theta)$$

Ex $f(x) = \sin(x)\cos(x)$ product rule

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

HANDOUT !! Practice sin(x) and cos(x).

Now what about the derivative of $f(x) = \tan(x)$?

$$\frac{df}{dx} = \frac{d}{dx}(\tan x) = \frac{d}{dx}\left(\frac{\sin x}{\cos(x)}\right) \quad \text{quotient rule.}$$

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

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

$$= \frac{1}{\cos^2 x} = \sec^2 x.$$

$$\text{so} \quad \boxed{\frac{d}{dx}(\tan(x)) = \frac{1}{\cos^2 x} = \sec^2 x.}$$

Ex $f(x) = \tan(\sqrt{x})$ chain rule
and tan x rule.

$$\frac{df}{dx} = \frac{1}{\cos^2(\sqrt{x})}\cdot\frac{d}{dx}\sqrt{x} = \frac{1}{\cos^2(x)}\cdot\frac{1}{2}x^{-1/2} = \frac{1}{2\sqrt{x}\cos^2(x)}$$

Ex YOU TRY: $\frac{\ln(2)\tan(x)}{\sin(x)} = f(x)$ simplify first !

$$f(x) = \frac{\ln(2)}{\cos(x)} = \ln(2)\cos^{-1}(x) = \ln(2)\left(-\cos^{-2}(x)\right)\cdot(-\sin(x))$$

$$= \frac{\ln(2)\sin(x)}{\cos^2(x)} = \frac{\ln(2)\tan(x)}{\cos(x)}$$