3.5 Trig Derivatives

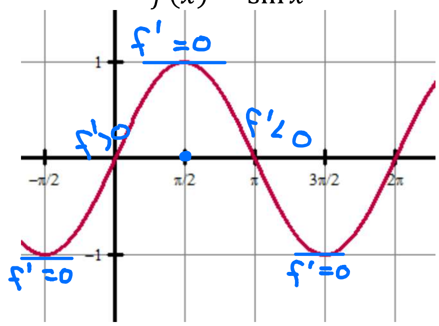
NOTES

CALCULUS

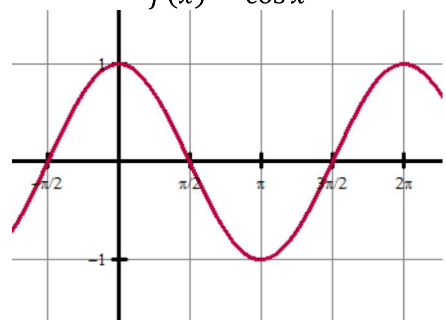
Write your questions here!

Sine and Cosine

$f(x) = \sin x$



$f(x) = \cos x$



The derivative of trig functions

$\frac{d}{dy}\sin(x) = \cos(x)$	$\frac{d}{dy}\csc(x) = -\csc(x)\cot(x)$
$\frac{d}{dy}\cos(x) = -\sin(x)$	$\frac{d}{dy}\sec(x) = \sec(x)\tan(x)$
$\frac{d}{dy}\tan(x) = \sec^2(x)$	$\frac{d}{dy}\cot(x) = -\csc^2(x)$

The "co's" are always negative and friends!

Find the derivative of the following.

$f(x) = \sin x + \tan x$

$f'(x) = \cos(x) + \sec^2(x)$

$y = \cos(3x)$

$y' = -\sin(3x)\cdot(3x)'$

$y' = -3\sin(3x)$

$y = 3x\cot(x^2)$

$\frac{dy}{dx} = (3x)'\cot(x^2) + (3x)\cdot[\cot(x^2)]'$

$= (3)\cot(x^2) + (3x)(-\csc^2(x^2))\cdot(x^2)'$

$= 3\cot(x^2) - (3x)\csc^2(x^2)\cdot 2x$

$= 3\cot(x^2) - 6x\csc^2(x^2)$

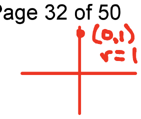
$f(x) = \sin^2(4x) = [\sin(4x)]^2$

$f'(x) = 2[\sin(4x)]^1\cdot[\sin(4x)]'$

$= 2\sin(4x)\cdot\cos(4x)\cdot(4x)'$

$= 2\sin(4x)\cdot\cos(4x)\cdot 4$

$f'(x) = 8\sin(4x)\cos(4x)$



Evaluate the derivative at the given point.

$$f(\theta) = \frac{1}{\sqrt{\cot\theta}} \text{ at } \theta = \frac{\pi}{2}$$

$$f(\theta) = [\cot(\theta)]^{-\frac{1}{2}}$$

$$f(\theta) = -\frac{1}{2}[\cot(\theta)]^{-3/2} \cdot [\cot(\theta)]'$$

$$= \frac{-1}{2\sqrt{\cot^3\theta}}(-\csc^2(\theta))$$

$$f(\theta) = \frac{\csc^2(\theta)}{2\sqrt{\cot^3\theta}}$$

$$f'(\tfrac{\pi}{2}) = \frac{\csc^2(\frac{\pi}{2})}{2\sqrt{\cot^3(\frac{\pi}{2})}}$$

$$= \frac{(1)^2}{2(\sqrt{0})^3}$$

$$= \frac{1}{0}$$

$$f'(\tfrac{\pi}{2}) = \text{und}$$

Find the equation for the line that is tangent and normal to

$$y = \sec x \text{ at } x = \pi$$

Point $(\pi, 1)$	Slope tangent	Slope Normal	tangent line	Normal line
$y = \sec(\pi)$	$y' = \sec(x)\tan(x)$	$\perp m = \text{und}$	$y = -1$	$x = \pi$
$y = 1$	$y' = \sec(\pi)\tan(\pi)$	(vertical)		
	$y' = (-1)(0)$			
	$y' = 0$			

BRING THE PAIN!

$$y = \frac{2x}{\csc(x^2 + \pi)}$$

$$y' = \frac{(2x)'[\csc(x^2+\pi)] - (2x)\cdot[\csc(x^2+\pi)]'}{[\csc(x^2+\pi)]^2}$$

$$= \frac{2\cdot\csc(x^2+\pi) - 2x[-\csc(x^2+\pi)\cot(x^2+\pi)](x^2+\pi)'}{\csc^2(x^2+\pi)}$$

$$= \frac{2\csc(x^2+\pi) + 2x\csc(x^2+\pi)\cot(x^2+\pi)(2x)}{\csc^2(x^2+\pi)}$$

$$y' = \frac{2\csc(x^2+\pi) + 4x^2\csc(x^2+\pi)\cot(x^2+\pi)}{\csc^2(x^2+\pi)}$$

SUMMARY:

Now, summarize your notes here!