AP Calculus AB
Tuesday, October 1, 2013

Bellwork:USETHEDEFINITIONOFDERIVATIVETOFIND f'(x)iff(x)=sin(x).Hint:Youwillneedto usethetrig identitysin(A+B)=sinAcosB+cosAsinBandalimit!

Today's Essential Question: How do I find the derivatives of trig functions?

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

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

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

$$f'(x)=\lim_{h\to 0}\left(\frac{\sin x(\cos h-1)}{h}+\frac{\cos x\sin h}{h}\right)$$

hold x constant

$$f'(x)=\lim_{h\to 0}\frac{\sin x(\cos h-1)}{h}+\lim_{h\to 0}\frac{\cos x\sin h}{h}$$

$$f'(x)=\sin x\cdot\underbrace{\boxed{\lim_{h\to 0}\frac{\cos h-1}{h}}}_{=0}+\cos x\cdot\underbrace{\boxed{\lim_{h\to 0}\frac{\sin h}{h}}}_{=1}$$

$$f'(x)=(\sin x)(0)+\cos x(1)$$

$$f'(x)=\cos x$$

$$* \frac{d}{dx}[\sin x]=\cos x$$

$$* \frac{d}{dx}[\cos x]=-\sin x$$

Prove/determine $\frac{d}{dx}[\tan x]$

$$\frac{\sin x}{\cos x}\to\frac{(\cos x)(\cos x)-\sin x(-\sin x)}{\cos^2 x}$$

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

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

$$=\sec^2 x$$

$$\frac{d}{dx}[\tan x]=\sec^2 x$$

Prove/determine $\frac{d}{dx}(\sec x)$

$$\sec x=\frac{1}{\cos x}$$

$$=\frac{(\cos x)(0)-(1)(-\sin x)}{\cos^2 x}$$

$$=\frac{\sin x}{\cos^2 x}$$

$$=\frac{\sin x}{\cos x}\cdot\frac{1}{\cos x}$$

$$=\tan x\sec x$$

$$\frac{d}{dx}[\sec x]=\sec x\tan x$$

$$\frac{d}{dx}[\csc x]=-\csc x\cot x$$

$$\frac{d}{dx}[\cot x]=-\csc^2 x$$

$$\frac{1}{x+1}+\frac{3}{x-1}$$

$$\lim_{h\to 0}\frac{\cos h-1}{h}=0$$

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

HW - derive f'(x) if f(x)=cosx
use defin of deriv just like
Bellwork