3.5 Day 2

Wednesday, September 21, 2016 7:25 AM

3.5B Notes Derivatives of Trigonometric Functions Name_____

1. Find the following derivatives.

a. $\frac{d}{dx}(\frac{1}{3}x^3 - \cos x)$

$x^2 - (-\sin x)$

$x^2 + \sin x$

b. $\frac{d}{dx} x^3 \cos x$

$\cos x (3x^2) + x^3(-\sin x)$

$3x^2\cos x - x^3\sin x$

c. $\frac{d}{dx}\frac{x^3}{\tan x}$

~~$\tan^2 x$~~ $(\tan x)^2$

$\frac{\tan x(3x^2) - x^3\sec^2 x}{\tan^2 x}$

$\frac{3x^2\tan x - x^3\sec^2 x}{\tan^2 x}$

2. Find the equation of the tangent line at the indicated point.

a. $y = \cos t, \quad t = \frac{\pi}{3}$

point $y = \cos(\frac{\pi}{3}) = \frac{1}{2}$

$m = y'$

$= -\sin t$

$= -\sin(\frac{\pi}{3}) = -\frac{\sqrt{3}}{2}$

$y - \frac{1}{2} = -\frac{\sqrt{3}}{2}(t - \frac{\pi}{3})$

b. $y = \csc x, \quad x = \frac{\pi}{4}$

$y = \csc(\frac{\pi}{4}) = \sqrt{2}$ $(\pi/4, \sqrt{2})$

$y' = -\csc x \cot x$

$= -\csc\frac{\pi}{4}\cot\pi/4$

$= -\sqrt{2}(1) = -\sqrt{2}$

$y - \sqrt{2} = -\sqrt{2}(x - \frac{\pi}{4})$

3. Show that both $y = \cos x$ *and* $y = \sin x$ satisfy $y'' = -y$ $\quad y'' = -y$

$y = \cos x$

$y' = -\sin x$

$y'' = -\cos x$

$y = \sin x$

$y' = \cos x$

$y'' = -\sin x$

$y''' = -\cos x$

$y'''' = \sin x$

4. Calculate the first five derivatives of $f(x)=\cos x$ then determine the 8th and 37th derivatives of $f(x)=\cos x$

$f(x)=\cos x$

$f'(x)=-\sin x$

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

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

$f^{(iv)}(x)=\cos x$

$\frac{d^8x}{dy^8}=\cos x$

$\frac{d^{37}x}{dy^{37}}=-\sin x$

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Jerk

Jerk is the derivative of acceleration. If a body's position at time *t* is *s(t)*, the body's jerk at time *t* is

$$j(t)=\frac{da}{dt}=\frac{d^3s}{dt^3}$$

6. A body is moving in simple harmonic motion with position function $s=f(t)$ (s in meters, t in seconds). Find the jerk at time t given $s=2+3\sin t$.

$s'=3\cos t$

$s''=-3\sin t$

$s'''=-3\cos t$

7. Find the values of x on the interval $(0,2\pi)$ where the tangent line to the graph of $f(x)=\sin x\cos x$ (u v) is horizontal. Check your solutions on your graphing calculator.

$m=0$

$f'(x)=0$

$f'(x)=\cos x(\cos x)+\sin x(-\sin x)$

$0=\cos^2x-\sin^2x$

$\sin^2x=\cos^2x$

$x=\frac{\pi}{4},\ \frac{3\pi}{4},\ \frac{5\pi}{4},\ \frac{7\pi}{4}$