Math 221 Fall 2009
9/29/2009
Quiz #5

Name: Key

Show all work clearly and in order. Please box your answers. 10 minutes.

[3] 1. Differentiate the following functions using any (correct) method.

(a) $g(t) = t^3 \cos(t)$

$g'(t) = t^3(-\sin(t)) + \cos(t)\,3t^2$ (product rule)

$\boxed{g'(t) = -t^3\sin(t) + 3t^2\cos(t)}$

(b) $y = \sec(\theta)\tan(\theta)$

$y' = \sec\theta\sec^2\theta + \tan\theta\sec\theta\tan\theta$ (product rule)

$\boxed{y' = \sec^3\theta + \sec\theta\tan^2\theta}$

(c) $f(t) = \dfrac{\sin(t)}{t}$

$\boxed{f'(t) = \dfrac{t\cos(t) - \sin(t)}{t^2}}$ (quotient rule) OR you can change transform the function first into $f(t) = t^{-1}\sin(t)$ and use the product rule.

[2] 2. If $f(x) = \sec(x)$, find $f''(\frac{\pi}{4})$.

$f'(x) = \sec(x)\tan(x)$ (from memory or use quotient rule)

$f''(x) = \sec(x)\sec^2(x) + \tan(x)\sec(x)\tan(x)$ (product rule)

$f''(\frac{\pi}{4}) = \sec(\frac{\pi}{4})\sec^2(\frac{\pi}{4}) + \tan(\frac{\pi}{4})\sec(\frac{\pi}{4})\tan(\frac{\pi}{4}) = (\sqrt{2})^3 + 1\cdot\sqrt{2}\cdot 1 = 2\sqrt{2}+\sqrt{2} = \boxed{3\sqrt{2}}$

[2] 3. $\lim_{\theta\to 0}\dfrac{\sin(\theta)}{\theta} = \boxed{1}$ (identity)

[3] 4. Find an equation of the tangent line to the curve $y = (1+x)\cos(x)$ at $x = 0$.

$y' = (1+x)(-\sin(x)) + \cos(x)$ (product rule)

$y'(0) = (1+0)(-\sin(0)) + \cos(0) = 1$

$y(0) = (1+0)\cos(0) = 1$

So an eqn. of the tangent line to the curve at the pt. $(0,1)$ is:

$\boxed{y - 1 = 1(x-0)}$ OR $\boxed{y = x+1}$