Math 1210: Worksheet #5 Fall 2017

Name: SOLUTION	A#:	Section:

[12] 1. Compute the derivative. **Do not simplify.**

(a) $\frac{d}{du}\left(\sec(e^{\sqrt{u}})\right) = \sec(e^{\sqrt{u}}) \cdot \tan(e^{\sqrt{u}}) \cdot e^{\sqrt{u}} \cdot \frac{1}{2\sqrt{u}}$

(b) $\frac{d}{dx}\left(x\ln(e^x+1)\tan^{-1}(x^2)\right) = \ln(e^x+1)\tan^{-1}(x^2) + x\frac{e^x}{e^x+1}\tan^{-1}(x^2)$

$+ x\ln(e^x+1)\frac{2x}{1+x^4}$

$\uparrow$ or $(x^2)^2$.

(c) $\frac{d}{dx}\left((\sin^{-1}(x))^{\sin(x)}\right) = \frac{d}{dx}e^{\sin x \ln(\sin^{-1}x)} = e^{\sin x \ln(\sin^{-1}x)}$.

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

(d) $\frac{d}{dt}\frac{\ln(t^4+1)}{t^4+1} = \frac{\frac{4t^3}{t^4+1}(t^4+1) - (\ln(t^4+1))4t^3}{(t^4+1)^2}$.

v5.AB

[4] 2. Find the equation of the tangent line to the curve

$$x + y - 1 = x\cos(y)$$

at the point $(0, 1)$.

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

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

$$y' = \frac{\cos y - 1}{1 + x\sin y}$$

$$y'\Big|_{\substack{x=0\\y=1}} = \frac{\cos(1) - 1}{1 + 0\cdot\sin(1)} = \cos(1) - 1 .$$

$$\boxed{y - 1 = (\cos(1) - 1)\, x}$$

[4] 3. Find the equation of the tangent line to the curve

$$3(x^2 + y^2)^2 = 25(x^2 - y^2)$$

at the point $(2, 1)$. (the curve is called lemniscate)

$$6(x^2+y^2)(2x + 2yy') = 25(2x - 2yy') .$$

$$y'(12y(x^2+y^2) + 50y) = 50x - 12x(x^2+y^2) .$$

$$y' = \frac{50x - 12x(x^2+y^2)}{12y(x^2+y^2) + 50y}$$

$$y'\Big|_{\substack{x=2\\y=1}} = \frac{50(2) - 12(2)(2^2+1^2)}{12(1)(2^2+1^2) + 50(1)} = \frac{-20}{110} = -\frac{2}{11}$$

Tangent: $\boxed{y - 1 = -\frac{2}{11}(x - 2)}$

v5.AB