Lab Quiz 3.3 20 minutes

Name: Solutions. Student ID:

Always justify your answers!

**Q1]... [2 points each]** For each of the following, calculate $\frac{dy}{dx}$.

(a)

$y = \sin(x)\tan(x)$ product rule gives

$$\frac{dy}{dx} = \sin(x)\frac{d}{dx}\tan(x) + \tan(x)\frac{d}{dx}\sin(x)$$ ] 1pt for rule

$$= \sin(x)\sec^2(x) + \tan(x)\cos(x)$$ ] 1pt for correct diff.

(b)

$y = \sin(3x^3 - 2x^2)$ chain rule.

$$\frac{dy}{dx} = \cos(3x^3-2x^2)\cdot\frac{d}{dx}(3x^3-2x^2)$$ ] 1 pt for rule

$$= \cos(3x^3-2x^2)(9x^2-4x).$$ ] 1 pt correct diff.

(b) Implicit diff.

$x^2 - 7y^2 = 6$

$\frac{d}{dx}(x^2 - 7y^2) = \frac{d}{dx}(6)$ ] 1 pt for implicit diff.

$\Rightarrow 2x - 7\left(2y \cdot \frac{dy}{dx}\right) = 0$ ] 1 pt for correct diff.

$\Rightarrow -14y \frac{dy}{dx} = -2x$

$\Rightarrow \frac{dy}{dx} = \frac{x}{7y}$.

(b)

$y = \frac{x^2 - x}{e^{-x}} = (x^2 - x)e^x$ (product rule now) ] 1 pt rule.

$\frac{dy}{dx} = e^x \frac{d}{dx}(x^2 - x) + (x^2 - x)\frac{d}{dx} e^x$ ]

$= (2x - 1)e^x + (x^2 - x)e^x$ ] 1 pt correct diff.

$= e^x(x^2 + x - 1)$.

(b)

$y = \tan(e^x)\cos(x)$ product and chain rule.

$\frac{dy}{dx} = \cos(x) \frac{d}{dx} \tan(e^x) + \tan(e^x) \frac{d}{dx} \cos(x)$ ] 1 pt for rule

$= \cos(x) \cdot \sec^2(e^x) \cdot e^x + \tan(e^x)(-\sin(x))$

$= e^x \cos(x) \sec^2(e^x) - \sin(x)\tan(e^x)$. ] 1 pt correct diff