Math 220 (section ???) Quiz 6 Fall 2010

Name SOLUTIONS

- No calculators allowed.
- Show sufficient work to justify each answer.
- You have 12 minutes for this quiz.

1. (3 points each) Differentiate the following functions.

   (a) $g(x) = \sec\left(x^3 + 10x\right)$

$$g'(x) = \sec(x^3+10x)\tan(x^3+10x)\cdot(x^3+10x)'$$

$$g'(x) = \sec(x^3+10x)\tan(x^3+10x)\cdot(3x^2+10)$$

or write $g(x) = \dfrac{1}{\cos(x^3+10x)}$

or $g(x) = \left(\cos(x^3+10x)\right)^{-1}$

before taking derivative

   (b) $f(\theta) = e^{2\theta}\cos 5\theta$

$$f'(\theta) = (e^{2\theta})'(\cos 5\theta) + (e^{2\theta})(\cos 5\theta)'$$

$$f'(\theta) = 2e^{2\theta}(\cos 5\theta) + e^{2\theta}(-5\sin 5\theta)$$

$$f'(\theta) = 2e^{2\theta}\cos 5\theta - 5e^{2\theta}\sin 5\theta$$

2. (4 points) One of the points on the graph of $f(x) = e^{-5x}$ has the property that the line tangent to the curve at that point is perpendicular to the line $y = 5x+3$. Find in simplified form the y-coordinate for this point.

$$f'(x) = -5e^{-5x}$$

any line perpendicular to the line $y = 5x+3$ must have slope $-\frac{1}{5}$ (the neg. reciprocal of 5)

so solve for x in the equation

$$-\frac{1}{5} = -5e^{-5x}$$

$$\frac{1}{25} = e^{-5x}$$

$$\ln\left(\frac{1}{25}\right) = \ln\left(e^{-5x}\right)$$

$$\ln(1) - \ln(25) = -5x$$

$$0 - \ln(25) = -5x$$

$$x = \frac{\ln(25)}{5}$$

so $y = f\left(\frac{\ln(25)}{5}\right) = e^{-5\left(\frac{\ln(25)}{5}\right)}$

$$= e^{-\ln(25)}$$

$$= \frac{1}{e^{\ln(25)}}$$

$$= 1/25$$