Math 121 F09N05 - Quiz 5 Name: SOLUTIONS.
Nov 9 2009 Stu#:

(1) [5 points] Determine $\lim_{x\to 0} \ln(\cos x)$.

As $x \to 0$, $\cos x \to 1$, so $\ln(\cos x) \to 0$

$$\therefore \lim_{x\to 0} \ln(\cos x) = 0.$$

(2) [5 points] Differentiate $\ln\left[\frac{(2t+1)^3}{(3t-1)^4}\right]$.

$$\frac{d}{dt}\left[\ln \frac{(2t+1)^3}{(3t-1)^4}\right]$$

$$= \frac{\cancel{(3t-1)^4}}{(2t+1)^{\cancel{3}\,1}} \cdot \frac{(3t-1)^{\cancel{4}\,1}(3)\cancel{(2t+1)^2}(2) - (2t+1)^{\cancel{3}\,1}(4)\cancel{(3t-1)^3}(3)}{(3t-1)^{\cancel{8}\,\cancel{5}\,1}}$$

$$= \frac{6(3t-1) - 12(2t+1)}{(2t+1)(3t-1)}$$

$$= \frac{-6t-18}{(2t+1)(3t-1)} = \frac{-6(t+3)}{(2t+1)(3t-1)}$$

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(3) [5 points] Use logarithmic differentiation to compute y', where

$$y = e^{\sin x}x^x$$

$$\ln y = \ln\left[e^{\sin x} x^x\right]$$

$$\ln y = \sin x + x\ln x$$

$$\therefore \quad \frac{1}{y} y' = \cos x + \ln x + \cancel{x}\frac{1}{\cancel{x}}$$

$$\therefore \quad y' = e^{\sin x} x^x \left[\cos x + \ln x + 1\right]$$