Math 121 S10N03 - Quiz 6 Name: SOLUTIONS.
Mar 16 2010 Stu#:

(1) [4 points] Determine the limit:

$$\lim_{x\to 3+} e^{2/(3-x)}$$

As $x \to 3^+$, $3-x \to 0^-$, so $\frac{2}{3-x} \to -\infty$, so $e^{\frac{2}{3-x}} \to 0$

$$\boxed{\therefore \lim_{x\to 3^+} e^{\frac{2}{3-x}} = 0.}$$

(2) [4 points] Differentiate:

$$y = \ln\left(e^{-x} + x^3 e^{-x}\right)$$

$$y = \ln\left[e^{-x}(1+x^3)\right]$$

$$= \ln(e^{-x}) + \ln(1+x^3)$$

$$= -x + \ln(1+x^3)$$

$$\boxed{\therefore \frac{dy}{dx} = -1 + \frac{1}{1+x^3}(3x^2).}$$

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(2) [**7 points**] Use logarithmic differentiation to determine the derivative:

$$y = (\sec x)^{1/x}$$

$$\ln y = \ln\left[(\sec x)^{\frac{1}{x}}\right]$$

$$\ln y = \frac{1}{x}\ln(\sec x).$$

$$\therefore \quad \frac{1}{y}\cdot y' = \left(\frac{-1}{x^2}\right)\ln(\sec x) + \frac{1}{x}\,\frac{1}{\cancel{\sec x}}\cdot\cancel{\sec x}\cdot\tan x$$

$$\therefore \quad \boxed{y' = (\sec x)^{\frac{1}{x}}\left[\left(-\frac{1}{x^2}\right)\ln(\sec x) + \left(\frac{1}{x}\right)\tan x\right]}$$