

Calculus 201-NYA-05 C3

Quiz 11

December 6, 2008

Name: SOLUTIONS
 Student ID: _____

1. Find the derivative:

a) (3 marks).

$$f(t) = \frac{3^{2t}}{t}$$

$$f'(t) = \frac{\frac{d}{dt} [3^{2t}] \cdot t - 3^{2t} \cdot \frac{d}{dt} [t]}{t^2}$$

$$= \frac{(\ln 3) 3^{2t} \cdot 2 \cdot t - 3^{2t} (1)}{t^2}$$

$$= \frac{(\ln 3)(2t) 3^{2t} - 3^{2t}}{t^2}$$

b) (3 marks).

$$g(x) = x \arctan 5x$$

$$g'(x) = \frac{d}{dx} [x] \arctan 5x + x \frac{d}{dx} [\arctan 5x]$$

$$= \arctan 5x + x \cdot \frac{1}{1+(5x)^2} \cdot \frac{d}{dx} [5x]$$

$$= \arctan 5x + \frac{5x}{1+25x^2}$$

c) (4 marks).

$$f(x) = x^{\cos x}$$

$$\text{Let } y = x^{\cos x}$$

$$\ln y = \cos x \ln x$$

$$\begin{aligned} \frac{1}{y} \cdot \frac{dy}{dx} &= \frac{d}{dx} [\cos x] \cdot \ln x + \cos x \frac{d}{dx} [\ln x] \\ &= (-\sin x) \ln x + \cos x \cdot \frac{1}{x} \end{aligned}$$

$$\frac{dy}{dx} = y \left[-\sin x \cdot \ln x + \frac{\cos x}{x} \right]$$

$$\frac{dy}{dx} = x^{\cos x} \left[-\sin x \cdot \ln x + \frac{\cos x}{x} \right]$$