Pledge:

10/18/2011
Dr. Lunsford

MATH261 Calculus I
Quiz 6

Name: Solution
(30 Points Total)

I. Find the indicated derivatives. Neatly show all work, simplify your answers, and <u>clearly indicate your answer</u>. (4 points each, 16 points total)

(a) $l(x) = 6\sqrt[3]{x^5} - \frac{8}{x^9} + e^3 = 6x^{5/3} - 8x^{-9} + e^3$

$l'(x) = 6\left(\frac{5}{3}x^{2/3}\right) - 8(-9x^{-10}) = 10x^{2/3} + 72x^{-10}$

or $10\sqrt[3]{x^2} + \frac{72}{x^{10}}$

(b) $y = \frac{2w^2 - 4\sqrt{w} + 7}{w} = 2w - 4w^{-1/2} + 7w^{-1}$

$\frac{dy}{dw} = 2 + 2w^{-3/2} - 7w^{-2}$

$= 2 + \frac{2}{\sqrt{w^3}} - \frac{7}{w^2}$

OR using QR:

$\frac{(4w - 2w^{-1/2})(w) - (2w^2 - 4w^{1/2} + 7)(1)}{w^2}$

$= \frac{4w^2 - 2w^{1/2} - 2w^2 + 4w^{1/2} - 7}{w^2}$

$= \frac{2w^2 + 2w^{1/2} - 7}{w^2}$

(c) $z = e^r \sec(r)\tan(r)$

$\frac{dz}{dr} = \left(\frac{d}{dr}e^r\right)(\sec(r)\tan(r))$

$+ e^r \frac{d}{dr}(\underbrace{\sec(r)\tan(r)}_{\text{product}})$

$= e^r\sec(r)\tan(r) + e^r(\sec(r)\tan(r)\tan(r) + \sec(r)\sec^2(r))$

$= e^r\sec(r)\tan(r) + e^r\sec^2(r)\tan(r) + e^r\sec^3(r).$

(d) $p(t) = \frac{3t^2 + t}{1 - t}$

$\frac{d}{dt}p(t) =$

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

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

Pledge:

III. Find the equation of and accurately graph the tangent line to the function $f(x) = x\cos(x)$ at $x = \pi$. Below you are given the graph of f. Neatly show all work to optimize your chance of receiving partial credit. Clearly indicate your answers. (6 points total)

Slope: $f'(x) = \cos x - x\sin x$

$f'(\pi) = \cos\pi - \pi\sin\pi = -1$

point: $f(\pi) = \pi\cos\pi = -\pi$

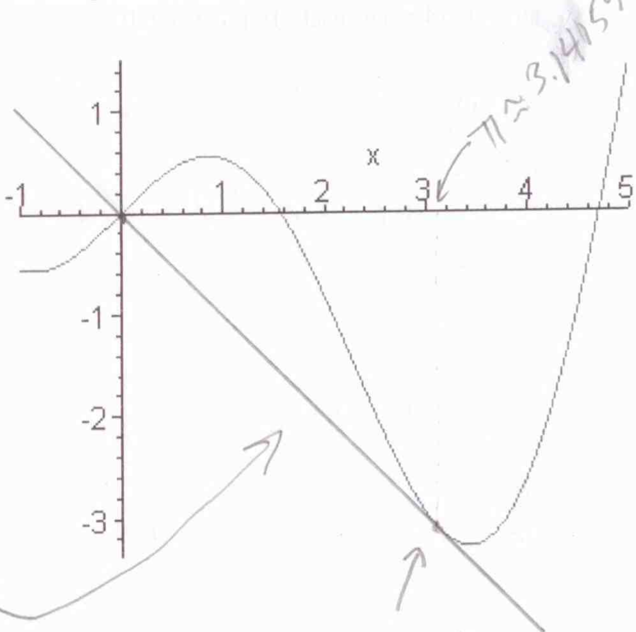
$(\pi, -\pi)$ is point on line

Equation

$y - (-\pi) = -1(x - \pi)$

$y + \pi = -x + \pi$

$\boxed{y = -x}$



$(\pi, -\pi)$

II. Find the indicated derivative. DO NOT SIMPLIFY your answer (8 points).

$$\frac{d}{dx}\left(\frac{\frac{e^x}{x^3} - x^{-4}}{\sqrt{x^3} - 7x^8\sin(x)}\right) = \frac{d}{dx}\left[\frac{e^x x^{-3} - x^{-4}}{x^{3/2} - 7x^8\sin(x)}\right]$$

quotient rule

$$= \frac{\left(\frac{d}{dx}\left(e^x x^{-3} - x^{-4}\right)\right)\left(x^{3/2} - 7x^8\sin(x)\right) - \left(e^x x^{-3} - x^{-4}\right)\frac{d}{dx}\left(x^{3/2} - 7x^8\sin x\right)}{\left(x^{3/2} - 7x^8\sin x\right)^2}$$

product rule

product rule

$$= \frac{\left(e^x x^{-3} + e^x(-3x^{-4}) + 4x^{-5}\right)\left(x^{3/2} - 7x^8\sin(x)\right) - \left(e^x x^{-3} - x^{-4}\right)\left(\frac{3}{2}x^{1/2} - 56x^7\sin x - 7x^8\cos x\right)}{\left(x^{3/2} - 7x^8\sin x\right)^2}$$