Pledge:

10/24/2011 MATH261 Calculus I Name: Solution
Dr. Lunsford Quiz 7 (60 Points Total)

I. Find the indicated derivatives. Neatly show all work, simplify your answers, and clearly indicate your answer. (8 points each, 32 points total)

(a) $l(x) = x^2 \sec(x^3)$

$l'(x) = 2x\sec(x^3) + x^2\sec(x^3)\tan(x^3)\,3x^2$

$= \boxed{2x\sec(x^3) + 3x^4\sec(x^3)\tan(x^3)}$

(b) $y = \dfrac{(2w+1)^{10}}{(7w-4)^{12}}$

$\dfrac{dy}{dw} = \dfrac{10(2w+1)^9(2)(7w-4)^{12} - (2w+1)^{10}(12(7w-4)^{11}(7))}{(7w-4)^{24}}$

$= \dfrac{4(2w+1)^9(7w-4)^{11}[5(7w-4) - 21(2w+1)]}{(7w-4)^{24}}$

$= \boxed{\dfrac{4(2w+1)^9[-7w-41]}{(7w-4)^{13}}}$

(c) $z = \tan(u^2e^{8u})$

$\dfrac{dz}{du} = \sec^2(u^2e^{8u})[2ue^{8u} + u^2 8e^{8u}]$

$= \boxed{2ue^{8u}\sec^2(u^2e^{8u})(1+4u)}$

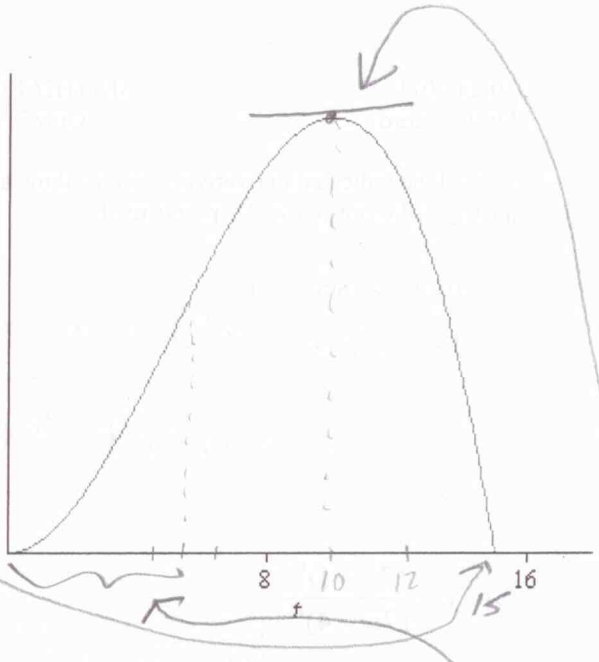
(d) $p(t) = \sin^4(2t) = (\sin(2t))^4$

$\dfrac{d}{dt}p(t) = 4(\sin(2t))^3(\cos(2t)(2))$

$= \boxed{8\sin^3(2t)\cos(2t)}$

Pledge:

II. Starting from rest an object moves vertically with height given by the function $h(t) = 60t^2 - 4t^3$ where h is in feet and t is in seconds. To your right you are given a graph of the height of the object. Please answer the questions below. You must show all work for full credit. (18 points total)



1. At what time does the object come back to ground level (i.e. height zero feet)? (4 points)

$h(t) = 0$

$60t^2 - 4t^3 = 0$

$4t^2(15-t) = 0$

$t = 0, t = 15$

$t = 15$ seconds

2. What is the terminal velocity of the object? (4 points)

$h'(t) = 120t - 12t^2$

$h'(15) = 120(15) - 12(15)^2 = -900$ ft/s

3. What is the maximum height achieved by the object? (5 points)

note that $h'(t) = 0$

$h'(t) = 120t - 12t^2$

$h'(t) = 0$

$120t - 12t^2 = 0$

$12t(10-t) = 0$

$t = 10$s. ← time when reach max height

$h(10) = 60(10)^2 - 4(10)^3$

$= 2000$ ft

4. During what times is the object accelerating? (5 points)

$h''(t) = 120 - 24t$

$h''(t) = 0 \Rightarrow 120 - 24t = 0$

$\Rightarrow t = 5$

sign chart:

	$(0,5)$	$(5,\infty)$
sign f''	+	−

So object is accelerating from 0 to 5 seconds.

III. Find the indicated derivative. DO NOT SIMPLIFY your answer (10 points).

$$\frac{d}{dx}\sqrt[3]{\cos(3x) + \sqrt[4]{x^2+9x+1}} = \frac{d}{dx}\left(\cos(3x) + (x^2+9x+1)^{1/4}\right)^{1/3}$$

$$= \frac{1}{3}\left(\cos(3x) + (x^2+9x+1)^{1/4}\right)^{-2/3}\left[-3\sin(3x) + \frac{1}{4}(x^2+9x+1)^{-3/4}(2x+9)\right]$$

chain

chain

chain