LAST NAME: _____

FIRST NAME: _____

STUDENT NUMBER: _____

TEST 2 (A)

DAWSON COLLEGE

103-DW Section 3 - Calculus 1

Instructor: E. Richer

Date: Oct. 23rd 2008

Question 1. *(2 marks each)*

Find the derivative of each function (you DO NOT need to simplify your answers).

(a) $f(x) = (\sin x)(x^3 - 5x^{-3})$

(b) $g(t) = e^{-t}(\tan x)$

(c) $f(x) = \frac{x \cos x}{x^2+1}$

(d) $h(t) = \frac{2t^2}{4t^4-3t}$

Question 2. *(3 marks each)*
Find the derivative of each function (you DO NOT need to simplify your answers).
(a) $g(t) = ((\cos t)(t^2 - 1))^4$
(b) $f(t) = \sin^5(5x)$
(c) $h(x) = \sqrt[4]{\frac{\cos x}{3x^5 - 3x^2}}$
(d) $f(x) = \sin(e^{\sin x})$

Question 3. *(4 marks)*
Find the equation of the tangent line to the curve $f(x) = x^3 e^{x^2}$ at the point $(1, e)$.

Question 4. *(4 marks)*
Find the first derivative of $f(x) = (2x-1)^2(4x+2)^3$, SIMPLIFY YOUR ANSWER, then compute the second derivative of $f(x)$.

Question 5. (*7 marks*)
The 2Hyper Company has determined that the demand for its energy drinks is given by $p = -0.004x + 20$, where p denotes the price of one case of energy drinks in \$ and x denotes the number of cases of energy drinks demanded.
The weekly cost incurred by 2Hyper Co. for producing x cases of energy drinks is $C(x) = 0.000001x^3 - 0.007x^2 + 10x + 150$ dollars.

(a) Find the marginal revenue function R'.
(b) Find the marginal profit function P'. The 2Hyper Co. currently sells $x = 4000$ cases of energy drinks per week. Are they making a profit? Would the make more profit if they increase their sales? Justify your answer.
(c) Find the average cost function $\overline{C}$ and the marginal average cost function $\overline{C}'$. What is the average cost of manufacturing one case of energy drink if $x = 1000$. Is the average cost rising or decreasing at this point? Justify your answer.

BONUS. (*2 marks*)
Find the 99th derivative of $f(x) = e^{2x}$.