Dawson College: **Calculus I**: 201-NYA-05-S4: Winter 2012

Name: _____
Student ID: _____

Test 2

This test is graded out of 48 marks. No books, notes, graphing calculators or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. *(5 marks)* Find the derivative of the following function and simplify:

$$f(x) = \frac{(3x^2+2)^5}{(5x+1)^6}$$

Question 2. *(5 marks)* Find the derivative of the following function:

$$g(t) = t^3 + \frac{1}{\sqrt{t}} + 2\sin t + 3\csc t + 4\arctan t$$

Question 3. *(4 marks)* Find the derivative of the following function:

$$h(z) = \sqrt{\operatorname{arcsec}(z^2+1)}$$

Question 4. *(4 marks)* Find the derivative of the following function:

$$f(x) = (3x^3+x)^{3/2}\sqrt{2x-1}$$

Question 5. The yearly demand for the Super Cool Fixed Gear bicycle is

$$p = 1000 - 0.04x \quad (0 \leq x \leq 20000)$$

where p denotes the wholesale unit price in dollars and x denotes the quantity demanded. The weekly total cost function associated with manufacturing the Super Cool Fixed Gear is given by

$$C(x) = 0.000003x^3 - 0.02x^2 + 300x + 70000$$

where C(x) denotes the total cost incured in producing x Super Cool Fixed Gear.

a. *(2 marks)* Find the revenue function R and the profit function P.

b. *(3 marks)* Find the marginal cost function C', the marginal revenue function R' and the marginal profit function P'.

c. *(2 marks)* Compute $P'(2000)$ and interpret your results.

Question 6. *(6 marks)* Find the third derivative of the following function. Simplify your final answer.

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

Question 7. Using the demand function:

$$p = 1000 - 0.04x$$

a. *(3 marks)* Calculate the elasticity of demand function $E(p)$.

b. *(2 marks)* Calculate the elasticity of demand when the price is set at \$750. Interpret the result.

c. *(1 mark)* At what price is the demand unitary?

Question 8. Given:

$$6+\sqrt{2}-2xy=\sqrt{y+1}$$

a. *(5 marks)* Find $\frac{dy}{dx}$.

b. *(2 marks)* Find the equation of the tangent to the graph of the given relation at $(1,3)$

Question 9. *(5 marks)* Find the equation of the tangent to the function $f(x) = \tan 2x$ at $x = \frac{\pi}{8}$.

Bonus Question. *(5 marks)*
Find the derivative of the following function but do *not* simplify.

$$f(x) = \cot\left(\sqrt{\frac{\arcsin(\tan x + x^2) + x}{\operatorname{arccot}(\sec x + e) - x}} + \pi\right)$$