Last name:(blockletters)_____ **First/Given Name:**_____

Student Number:_____

MATH 121 - TEST 2 (Based on Assignments 4, 5, 6 and 7)
Version 3A Fall 2010

This test consists of 3 questions to be answered in the space provided.
Show all work and give explanations when needed.

1. A Boeing 747 aircraft traveling at speed s (in km/h) can travel $g(s)$ kms per liter of fuel. In particular, when traveling at $s = 900$ km/h, the plane can travel $g(900) = 0.08$ km per liter of fuel, and $g'(900) = -0.0004$.

   We now define $f(s)$ as the gas consumption (in l/km) of the aircraft.

   (a) Write $f(s)$ in terms of $g(s)$.

   (b) Find the values of $f(900)$ and $f'(900)$. Include units in your answers.

2. Consider the curve defined by the relation $x^2 + y^2 + ax + 3y = 7$ where a is a positive constant.

   (a) Find $\dfrac{dy}{dx}$.

   (b) Under what conditions on x and/or y will the tangent line to this curve be **horizontal**?

   (c) Under what conditions on x and/or y will the tangent line to this curve be **vertical**?

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3. The total revenue (in thousands of dollars) generated by selling q items is given by the formula

$$R(q) = \frac{q-5}{10+q}, \text{ given } q \geq 5$$

(a) Using the formula for the total revenue for q units given above, write a formula for $A(q)$, the **average revenue per unit** (thousands of dollars/unit)

(b) Find the value of q for which the average revenue per unit is maximized.

(c) Part of the graph of $R(q)$ is shown on the graph below. Indicate the maximum value you found from part (a), and clearly show how the average revenue for that value of q is represented on the graph.