MATH 112 - Winter 2005
Exam 2, Version 1 - Hints and Answers

1. (4 points each)

   (a) $f'(t) = (t^4 - 4t^3 + 2t)(5t^4 + 24t^3 + 18t) + (t^5 + 6t^4 + 9t^2)(4t^3 - 12t^2 + 2)$

   (b) $R'(q) = \dfrac{(1 + 4e^q) \cdot \frac{1}{q^2-4q} \cdot (2q - 4) - \ln(q^2 - 4q) \cdot (4e^q)}{(1 + 4e^q)^2}$

   (c) $f_x(x, y) = 2xe^y + (e^{x^2})(2x)y + e^{x^2y}(2xy)$

   (d) $f_y(x, y) = x^2e^y + e^{x^2} + e^{x^2y}(x^2)$

2. (10 points) HINT: The five vertices are $(0, 2)$, $(0, 10)$, $(5, 9)$, $(7, 0)$ and $(3, 0)$.

   ANSWER: maximum=101; minimum=12

3. (4 points each)

   (a) HINT: $MC(q) = 0.03q^2 - 0.6q + 3$. The question asks where this function has a horizontal tangent line. So, you must compute the q at which $MC'(q) = 0$. $MC'(q) = 0.06q - 0.6$. Set this equal to 0 and solve for t.
   ANSWER: $q = 10$

   (b) i. ANSWER: global maximum= $MC(3) = 1.47$; global minimum= $MC(8) = 0.12$

      ii. ANSWER: global maximum= $MC(15) = 0.75$; global minimum= $MC(10) = 0$

   (c) ANSWER: $P(q) = -0.01q^3 + 0.22q^2 - 0.65q - 4$
   $P'(q) = -0.03q^2 + 0.44q - 0.65$. We need to know if P has a horizontal tangent line at $q = 13$. Plugging 13 into P' gives $P'(13) = 0$. So, P has a horizontal tangent line at $q = 13$.
   $P''(q) = -0.06q + 0.44$ Plugging 13 into P'' gives $P''(13) = -0.34$, which is negative. So, P is concave down at 13.
   Since P has a horizontal tangent and is concave down at $q = 13$, $q = 13$ gives a local maximum of profit.

4. (4 points each)

   (a) HINT: $f_x(x, y) = x - 5 + 2y$ and $f_y(x, y) = -y - 4 + 2x$. Set these partial derivatives equal to 0 and solve the resulting system of equations.
   ANSWER: $(x, y) = (2.6, 1.2)$

   (b) HINT: $A \approx f_x(5, 5) = 10$; $B \approx f_y(5, 5) = 1$
   ANSWER: A is bigger

   (c) HINT: $h'(1) = f_y(6, 1) = 7$, $k'(5) = f_x(5, 2) = 4$
   ANSWER: i is steeper