MATH 112 – EXAM II Hints and Answers
Version Alpha
Winter 2006

1. (5 points each)

   (a) $\dfrac{dx}{dy} = x^3 \cdot 12(4x+9)^{11}(4) + (4x+9)^{12} \cdot 3x^2$

   (b) $f'(z) = 6[\ln(7e^z + z^2)]^5 \cdot \dfrac{1}{7e^z + z^2} \cdot (7e^z + 2z)$

   (c) $\dfrac{dy}{dx} = \dfrac{\sqrt{6x+1}[e^{3x} \cdot 4x^3 + (x^4+5)e^{3x} \cdot 3] - e^{3x}(x^4+5) \cdot \frac{1}{2}(6x+1)^{-1/2}6}{(\sqrt{6x+1})^2}$

2. (a) (2 points) HINT: $h(q)$ is a quadratic function whose graph is a parabola that opens upward. Find its vertex.

   ANSWER: from $q = 0$ to $q = 60$ Things

   (b) (2 points) ANSWER: $TR(q) = h(q) \cdot q = q^3 - 120q^2 + 3600q$

   (c) (6 points) HINT: Compute $TR'(q)$, set it equal to 0, and solve for q to find the critical numbers of TR. Plug the critical numbers and the endpoints of the interval back into the formula for TR.

   ANSWER: $q = 20$ Things

   (d) (2 points) ANSWER: $h(20) = 1600$ dollars per Thing

3. (a) (4 points) ANSWERS: $f_x(x, y) = 10x - 39.8 + y$; $f_y(x, y) = 12y - 73 + x$

   (b) (5 points) HINT: Set $f_x(x, y) = 0$ and $f_y(x, y) = 0$ and solve the resulting system of equations.

   ANSWER: $(x, y) = (3.4, 5.8)$

   (c) (4 points) HINT: The steepness of the graph of $g(t)$ at $t = 10$ is measured by the slope of the tangent line to $g(t)$ at $t = 10$. That's $g'(10)$, which is equal to $f_x(10, 15) = 75.2$. Similarly, the steepness of the graph of $h(t)$ at $t = 15$ is measured by $h'(15)$, which is $f_y(10, 15) = 117$.

   ANSWER: B

4. (10 points) HINTS: The constraints are $x \le 200$, $y \le 150$, and $x + y \le 280$. The objective function is $P(x, y) = 1.25x + 1.40y$. The feasible region is a five-sided polygon with vertices $(0, 0)$, $(0, 150)$, $(200, 0)$, $(200, 80)$, and $(130, 150)$.

   ANSWER: $x = 130$ and $y = 150$ bags