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

1. (4 points each)

   (a) ANSWER: $f'(x) = 2x^7 - 2x^5 - \frac{7}{2}x^{-3/2}$
   (b) HINT: $w = 4z^{-5} - 11z^{-6}$
   ANSWER: $\frac{dw}{dz} = -20z^{-6} + 66z^{-7}$
   (c) HINT: $h(t) = t^3 + 4t + 3t^{-1}$. Compute $h'(1)$.
   ANSWER: $h'(1) = 4$
   (d) HINT: Compute $TR'(q)$, set it equal to 0, and solve for q.
   ANSWER: $q = 1273$

2. (a) (3 points) HINT: Take $q_1 = 2$ and $q_2 = 7$. Then $TC(7) - TC(2) = 125$ by the formula. Divide by 5.
   ANSWER: 25
   (b) (4 points) HINT: Take $q_1 = 0$ and $q_2 = 10$. Then $TC(10) - TC(0) = 260$ by the formula. You know $TC(10) = 326$ and $TC(0) = FC$. Solve for FC.
   ANSWER: 66
   (c) (3 points) HINT: Take $q_1 = 4$ and $q_2 = 4.001$. Then $MC(4) = TC(4.001) - TC(4) =$ 0.024001 thousand dollars, by the formula.
   ANSWER: 0.024001 thousand dollars OR $24.001
   (d) (5 points) HINT: Take $q_1 = q$ and $q_2 = q + h$. Then, $TC(q+h) - TC(q) = (q+h)^2 - q^2 + 16(q + h - q)$. Expand and simplify, divide by h, and let h go to 0 to get the derivative.
   ANSWER: $TC'(q) = 2q + 16$
   (e) (2 points) HINT: Evaluate your answer to part (d) at $q = 7$ thousand Items.
   ANSWER: 30 dollars

3. (a) (2 points) HINT: Balloon A is always decreasing. Its lowest altitude on the interval from $t = 3$ to $t = 18$ is $A(18)$.
   ANSWER: 140 feet
   (b) (5 points) HINT: The ballons are farthest apart when their speeds are the same. Compute $A'(t)$ and $B'(t)$, set the derivatives equal to each other and solve for t.
   ANSWER: 3.51
   (c) (4 points) HINT: Balloon B is rising as long as its derivative is positive. The graph of $B'(t)$ is a parabola that opens down. It's positive in between its two roots. So, set $B'(t) = 0$ and solve for t.
   ANSWER: from $t = 5$ to $t = 8$
   (d) (3 points) HINT: Balloon B is moving up when $B'(t)$ is positive. Its fastest upward speed is the highest point on the graph of $B'(t)$ between $t = 5$ and $t = 8$. Find the t-coordinate of the vertex of $B'(t)$.
   ANSWER: $t = 6.5$ minutes
   (e) (3 points) HINT: $B'(t)$ is negative and increasing from $t = 1$ to $t = 4$. So, its fastest downward speed is at $t = 1$. Compute $B'(1)$.
   ANSWER: 84 feet per minute