MATH 112 C - Winter 2004
Exam 2, Version 1 - Hints and Answers

1. (4 points each)

   (a) i. ANSWER: $f_y(x, y) = 10xy^4 + 3x^2$

   ii. ANSWER: $\dfrac{\partial E}{\partial b} = 2b + 25m - 9$; $\dfrac{\partial E}{\partial m} = 80m + 25b - 16$

   iii. ANSWER: $\dfrac{\partial w}{\partial t} = \dfrac{(7st^5 - e^{st}) \cdot 9(s^2t^4 - 5st)^8(4s^2t^3 - 5s) - (s^2t^4 - 5st)^9(35st^4 - se^{st})}{(7st^5 - e^{st})^2}$

   (b) ANSWER: $P(t) = 20.09e^{0.02t}$

2. (a) (6 points) ANSWER: $D(x) = 2x^3 - 19.5x^2 + 60x$; $D'(x) = 6x^2 - 39x + 60$; $D''(x) = 12x - 39$

   (b) (4 points) HINT: Set $D'(x) = 0$ and solve for x using the quadratic formula (or factoring, if you like). This gives two values of x: $x = 2.5$ and $x = 4$.

   ANSWER: $D''(2.5)$ is negative, which means that D is concave down at 2.5 and, thus, $D(x)$ has a local maximum at $x = 2.5$. $D''(4)$ is positive, which means that D is concave up at 4 and, thus, $D(x)$ has a local minimum at $x = 4$.

   (c) (3 points) HINT: The only candidates for the global minimum are $x = 1$, $x = 2.5$, and $x = 3$. Plug these values into $D(x)$ and choose the smallest result.

   ANSWER: $D(1) = 42.5$ is the smallest value of $D(x)$ on the interval from $x = 1$ to $x = 3$.

   (d) (4 points) HINT: $T(x)$ is the derivative of $f(x)$. That is, $T(x) = 8x^3 - 58.5x^2 + 120x$. Compute $T''(x)$, set it equal to 0, and solve for x.

   ANSWER: $x = 2.4375$

3. (17 points) HINT: You need to maximize the profit function, $P(x, y) = 3x + 2y$, subject to the constraints $2x + y \leq 500$ and $3x + 3y \leq 900$. The vertices of your feasible region are $(0, 0)$, $(250, 0)$, $(0, 300)$, and $(200, 100)$. Plug each of the vertices into the profit function and choose the largest result.

   ANSWER: $x = 200$, $y = 100$, max profit = \$800