Math 203 Extra Credit Problems

(1) You estimate that you will sell 40 necklaces a year at your jewelry store. Storing the necklaces costs \$8 per necklace (based on the average number of necklaces). To make a new order costs \$10. Let x represent the number of necklaces in each order and r represent the number of orders.

    (a) Find a function for the total inventory cost (carrying cost + ordering costs) associated with ordering and storing the necklaces.

    (b) Find the amount of necklaces per order you should make to minimize the inventory cost. How many orders per year is that?

(2) Bacteria is growing in a petri dish in such a way that they always form a circle. Suppose that the area of the circle is increasing at a rate of 3 cm^2/day. What is the rate of change of the radius when the radius is 4 cm.

(3) Evaluate the following integrals. (**Don't forget** $+C$ **when necessary!**)

    (a) $\displaystyle\int \left(4e^{-2x} + \sqrt[4]{x}\right) dx$

    (b) $\displaystyle\int_{\sqrt{e}}^{e} \left(3x + \frac{1}{x}\right) dx$

    (c) $\displaystyle\int_{1}^{8} \frac{1}{\sqrt[3]{x}} dx$

    (d) $\displaystyle\int \left(x^2 + 2x^4 + \frac{1}{x^4}\right) dx$

(4) Find $\dfrac{dy}{dx}$ for the following functions. **You do not have to simplify your answer.**

    (a) $y = 2\ln(e^x + 4x + 2)$

    (b) $y = (x+1)^2 e^x$

    (c) $y = e^{\sqrt{x} + 2x + 5}$

    (d) $y = \dfrac{e^x}{\ln x + 2x^2}$

(5) Use logarithmic differentiation to find the derivative of $y = \dfrac{(4x^2 + 5x)^2 \sqrt{x^3 + 2x^2 + 5}}{(x+4)^{10}}$. You do not need to simplify your answer.

(6) A box with a square base must have a volume of 8 in^3. What are the dimensions of the box that will minimize the amount of material needed to build it (i.e. minimize surface area).
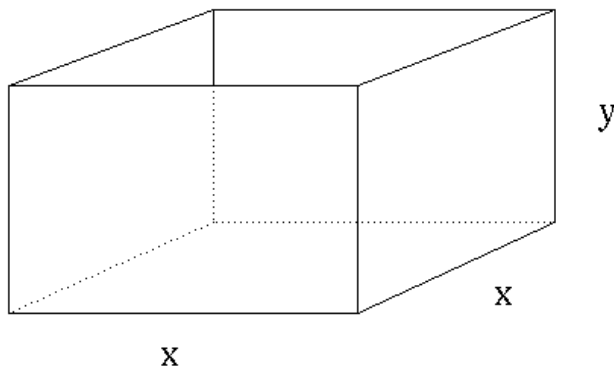
(7) Find an equation of the line tangent to $y^3 + 4x^2 + y = 2$ at $(0, 1)$