Math 126 Fall 2005
Problem Set #2

DUE: Friday, December 2, *IN CLASS*
(Late papers: -8 pts per day, or portion of a day, late)

Answer all questions on separate paper. Write on One side of each page, only. Show all work, and any pertinent explanations for what you did. Write neatly, and be sure to organize your work in a logical, coherent manner. What you turn in must NOT LOOK LIKE YOUR ROUGH DRAFT. There should be no cross-outs. It should be a polished piece of work. ***I WILL NOT GRADE MESSY WORK!!***
Credits are indicated.

1. Find $\frac{dy}{dx}$ for each of the following:

   a) $y = 2x^2(3x-5)^4$ (+5)

   b) $2x^2 + xy^2 + y = 14$ (+5)

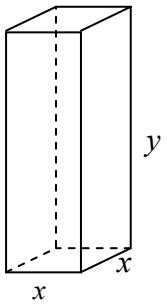
2. Given $f(x) = \sqrt{x^2+4}$. Find $f''(x)$. (+10)

3. Find the absolute extremes of the graph of $f(x) = \frac{x}{x^2+1}$ on the interval [-1, 5]. (+10)

4. Determine the coordinates of all local extremes and points of inflection of the graph of $y = f(x) = x^3 - 6x^2 + 4$. Be sure to show the work that verifies your conclusions. Use the conclusions to sketch the graph of f(x) which shows all the relative extremes, the proper concavity, and the point(s) of inflection. (+10)

5. Solve for x: $6.05 = e^{2.5x}$ (+5)

6. Postal regulations require that a package sent through the mail have combined length and girth of 108 inches or less. Girth is defined to be the perimeter of the bottom of the box, and length is the height. (For such a box with square base as shown below, length plus girth of the box is equal to $4x + y$.) Find the dimensions of such a package with a square base that has the greatest possible volume. (+10)



7. A) Differentiate $f(x) = \ln\left(\frac{x+1}{x-1}\right)$ B) Given $y = t^2e^{-2t}$. Find $\frac{d^2y}{dt^2}$ (+10 each)

EXTRA CREDIT: (+50) Given $f(x) = \frac{x}{1-x}$. Find $f'(x)$, $f''(x)$, $f'''(x)$, $f^{(4)}(x)$, and $f^{(5)}(x)$. Then guess a formula for $f^{(n)}(x)$. Your formula for $f^{(n)}(x)$ will involve factorials.
You will recall factorial notation: $n! = n(n-1)(n-2)\cdots 3\cdot 2\cdot 1$