Math 130 Exam 3 Sample 2

Directions: Do not simplify unless indicated. Non-graphing calculators are permitted. Show all work as appropriate for the methods taught in this course. Partial credit will be given for any work or words which are relevant to the problem. Units should be included for all real-world problems.

Please put problem 1 on answer sheet 1

1. Find the maximum and minimum values of the function $f(x) = (x-3)(x-1)^3$ on the interval $[-2, 3]$.

Please put problem 2 on answer sheet 2

2. Suppose (x, y) is a point in the first quadrant which lies on the graph of $y = \frac{3}{x}$. A rectangle is formed with $(0, 0)$ and (x, y) as opposite corners. Find the value of x which gives you the rectangle of minimum perimeter. Use the technique dealing with maximums and minimums on an arbitrary interval to solve this problem.

Please put problem 3 on answer sheet 3

3. (a) Find the equation of the line tangent to the graph of $y = ...$ at the point $(2, -1)$ where y satisfies $x^2 y^2 - \frac{x}{y} = 3x$.

   (b) A patch of moss in the shape of a perfect circle is growing at a rate of 5 square inches per year. How fast is the radius growing when the area is 100 square inches?

Please put problem 4 on answer sheet 4

4. Find each of the following indefinite integrals:

   (a) $\int \frac{1}{x} - 2x + 3 \ dx$

   (b) $\int x(x+2)(5x-1) \ dx$

   (c) $\int \frac{x^2 e^x - 3x + x^5}{x^2} \ dx$

   (d) $\int 2^{5x} \ dx$

Please put problem 5 on answer sheet 5

5. (a) Use substitution to evaluate $\int \sin x e^{(1 + 4\cos x)} \ dx$.

   (b) Use substitution to evaluate $\int \frac{x^2}{4x-8} \ dx$.

   (c) Suppose the rate at which a disease spreads at time t in months is given by $4t + 5$ people per month. If 100 people have the disease after one year, find the function $D(t)$ giving the number of people with the disease after t months. Then find the number of people with the disease after two years.