Math 130 Exam 3 Sample 1

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 $f(x) = -20x^{2/3} + x^{5/3}$ on the interval $[-1, 8]$. If you are careful this works out nicely.

Please put problem 2 on answer sheet 2

2. Suppose you are fencing in a rectangular area of dimensions $L \times W$. The lengths cost \$20/ft while the widths cost \$10/ft. The area must be 1000ft^2. Find the dimensions which will minimize the cost. Make sure you justify why your answer is a minimum.

Please put problem 3 on answer sheet 3

3. (a) Solve for $\frac{dy}{dx}$ where $x^2 + x\ln(y) + y = 2x + 1$.

   (b) A light is mounted in the ground and points at a wall 50 feet away. A six-foot man walks toward the light at a rate of 2 feet per second. How is the length of his shadow changing at the instant when he is 10 feet from the light?

Please put problem 4 on answer sheet 4

4. Find each of the following indefinite integrals:

   (a) $\int x^2 - 3x + 1 \ dx$

   (b) $\int (x^2 - 4x)(x + 1) \ dx$

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

   (d) $\int e^x + 10^x \ dx$

Please put problem 5 on answer sheet 5

5. (a) Use substitution to evaluate $\int e^{-3x} \ dx$.

   (b) Use substitution to evaluate $\int x\sqrt{2x + 3} \ dx$.

   (c) Suppose a population $P(t)$ grows such that $P'(t) = 2t + e^{3t}$. If the starting population is 100 find the function $P(t)$ and then find and interpret $P(20)$.