MATH 242
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University of South Carolina
Spring 1995

Homework 2 – Calculus Review

Due: Friday, 20 January 1995

Purpose

- To complete our brief review of background material for this course I have selected the following problems that require the use of Calculus. I will collect your solutions to these problems at the beginning of Friday's class. We will devote the remainder of Friday's class to solving these problems – by hand and by computer.
- If you have forgotten how to work problems such as these, I suggest that you spend some time reviewing these techniques. Of particular importance are the product and chain rules, implicit differentiation, and the use of differentiation to identify max/min. The techniques of substitution and integration by parts are the most important integration techniques. We will also need to recall some basic facts about improper integrals.
- Not all of these will be used for every problem. The reason that I devote time to them at this point in the semester is that we need to be able to apply these concepts whenever they are needed. This is very much like the way the real world operates; we never know what awaits us around the next corner, but the fact that we are confident in our ability to deal with whatever situation we might encounter.
- If you have any questions about the assignment, please send them to me in an e-mail message.

Problems

1. Find the derivative of each of the following functions
   (a) $x(t) = 3e^{-4t} + te^{-4t} + \tan(t^2)$
   (b) Find $\frac{dy}{dx}$ when $e^{xy} + y = x - 1$ implicitly defines y as a function of x.
2. Solve the equation $e^{3y^2} = 2e^{xy-\ln(x^2)}$ for y.
3. Find the global maximum and minimum of $x(t) = \frac{5}{3}e^{-2t}\sin(6t)$ for $t > 0$.
4. Evaluate each definite or indefinite integral
   (a) $\displaystyle\int -2x^{-1}\,dx$
   (b) $\displaystyle\int xe^{-ax^2}\,dx$, ($a$ a constant)
   (c) $\displaystyle\int_1^3 \frac{2s^2+3s+3}{s(s+1)^2}\,ds$
5. Evaluate the improper integral $\int_0^\infty te^{-st}\,dt$. (Assume $s > 0$.)