Math. 301-01
Fall, 1999
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First Examination, Take 2
Friday, September 24, 1999

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is open book, open notes, and computer-on. You may leave after handing in your exam paper, but be sure to check your answers carefully. Each entire problem is worth 20 points.

1. Sketch a graph of a possible antiderivative $F(x)$, if $F'(x) = f(x)$ and $F(0) = 1$, where the function $f(x)$ is given in Figure 1. Be sure to label the points A, B, C, D, E, F, and G on your graph of the antiderivative.

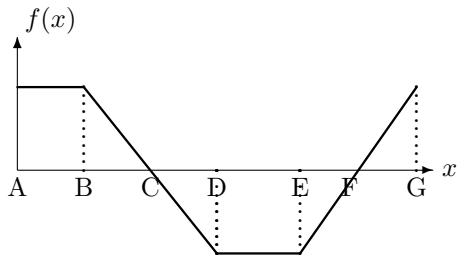

Figure 1: The derivative f for Problem 1

2. If an antiderivative of f is shown in Figure 2, then write down $\int_2^4 f(x)dx$.

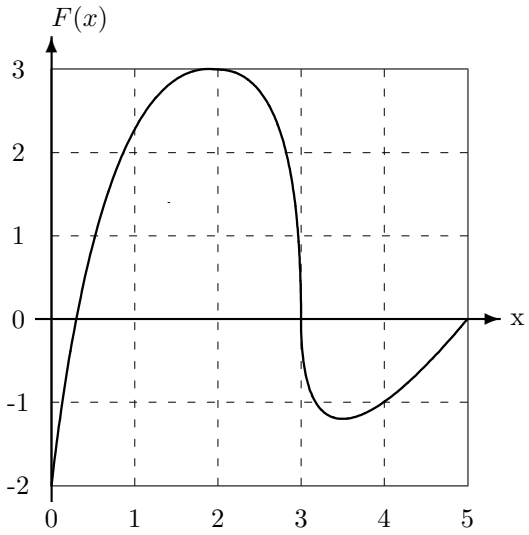

Figure 2: The antiderivative for Problem 2

3. Find each of the following. In the case of the definite integrals, give an exact numerical answer, except you may leave transcendental numbers such as log(5). Although you may use the computer as an aid, you must write down the set of steps you would take to do the problem by hand.

(a) $\int_0^{1/2} \frac{x}{x^2-1} dx$ (b) $\int \frac{1}{x^2-1} dx$

(c) $\int e^{3x} \sin(2x) dx$ (d) $\int_0^{\pi/2} \cos(x) e^{\sin(x)} dx$

4. Suppose a car is initially travelling at 60 miles per hour (that is, at 88 feet per second), and at time $t = 0$, a constant strong forward acceleration of $10\text{ft}/\text{sec}^2$ is applied.
   (a) Derive an equation for the number of feet the car has travelled as a function of time t in seconds after the acceleration began.
   (b) How long does it take for the car to reach a speed of 75 miles per hour (110 feet per second)?
   (c) How far has the car travelled by the time it reaches 75 miles per hour?

5. Find the solution to the initial value problem $y' = xe^{x^2}$, $y(0) = 2$.