Exam 4   Calc 1   2/21/2006

Each problem is worth 10 points. For full credit provide complete justification for your answers.

1. Suppose that the following table of values gives a car's speed as it accelerates after a light turns green, then brakes to a stop at the next intersection. Based on this data, give a lower approximation for the distance the car traveled between the two intersections.

t (seconds)	0	5	10	15
speed (feet/second)	5	40	50	10

2. Use a right-hand sum with three equal subintervals to approximate the value of $\displaystyle\int_{1}^{7}\frac{1}{x}\,dx$ to the nearest hundredth.

3. Evaluate $\displaystyle\int_{1}^{7}\frac{1}{x}\,dx$ exactly.

4. If a company's expected profits t years from now, in millions of dollars per year, are given by $p(t)$ $= 40 + 5t$, what total profit can the company expect over the next five years?

5. Evaluate $\int \sqrt{4-t}\, dt$.

6. Let $F(x) = \int_0^x \cos(\theta^3)\,d\theta$.

   a. Evaluate $F(0)$.

   b. Evaluate $F'(0)$.

7. Find the area bounded between $y = 4 - x^2$ and $y = 3x$.

8. Biff is a calculus student at Enormous State University, and he's having some trouble. Biff says "Dude, I think they just try to make this calculus stuff harder than it really is. Our TA was making this big deal about how you can only do definite integrals if they're continuous or something, but that's crap. There was one on our test where it wasn't continuous, and I did it anyway, and the answer I got was right there on the multiple choice list. Why would it be such a big deal if it wasn't continuous?"

   Explain clearly to Biff why it indeed does matter if the integrand is continuous, or when it doesn't matter.

9. **Set up** an integral for the area inside the circle $x^2 + y^2 = 25$, but above the line $y = 4$.

10. Find the area of one arch of a function of the form $g(x) = \sin(nx)$, where n is some positive integer.

Extra Credit (5 points possible): Evaluate $\displaystyle\int_0^{\pi/6} \tan^5 \theta \, d\theta$.