Problem Set 3   **Calculus 2**   **Due 9/30/05**

You are encouraged to work in groups of two to four on this assignment and make a single group submission. Each problem is worth 5 points. For full credit indicate clearly how you reached your answer. All work must be legible and submitted on clean paper without ragged edges.

1. Use *Mathematica* to evaluate the integrals

   a) $\int \sin 3x \cos 5x\,dx$ b) $\int \sin 3x \cos 4x\,dx$ c) $\int \sin 3x \cos 7x\,dx$

Conjecture a general formula for $\int \sin ax \cos bx\,dx$ (don't prove it, just spot the pattern).

2. Consider the solid formed by rotating the region under $y = 1/x$ from $x = 1$ to $x = b$ around the x-axis. What is the volume of this solid when $b = 10$? When $b = 100$? When $b = 1000$?

3. Evaluate $\int x \arctan x\,dx$.

4. Find the volume of the ellipse with equation $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1.$