HOMEWORK 10, MATH 233
DUE MONDAY, APRIL 1, 2002

Points are allocated as shown in brackets for a total of 30 points.

(1) [6] (See #22, p. 882, §12.6) Find the surface area of the part of the cylinder $y^2 + z^2 = 1$ which lies inside the cylinder $x^2 + z^2 = 1$.

(2) [6] (See #10 page 891 of §12.7) Express as an iterated integral and evaluate $\iiint_E xz\,dV$, where E is the solid tetrahedron with vertices $(0,0,0)$, $(0,1,0)$, $(1,1,0)$ and $(0,1,1)$.

(3) (§12.7) Consider the solid quarter-ball lying above the xy-plane, to the right (that is, $y \geq 0$) of the xz-plane and below the hemisphere $z = \sqrt{1 - x^2 - y^2}$. Suppose this solid has uniform mass density $\rho = 1$.

  (a) [4] Find the moment about the xz-plane. Note: Evaluate the integral by hand, not numerically. With rectangluar coordinates, you might find useful the formula #37 of the Table of Integrals at the end of the book. With cylindrical coordinates, formula #31 might be the ticket.

  (b) [2] Find the center of mass $(\bar{x}, \bar{y}, \bar{z})$ of this solid.

(4) (See #30, p. 892, §12.7) Consider the integral

$$\int_0^1 \int_0^{1-x^2} \int_0^{1-x} f(x,y,z)\,dydzdx$$

  (a) [3] Rewrite the integral in the order $dzdxdy$.

  (b) [3] Rewrite the integral in the order $dxdydz$.

(5) [6] (#20 page 899 of §12.8) Find the volume of the solid that lies within the sphere $x^2 + y^2 + z^2 = 4$, above the xy-plane, and below the cone $z = \sqrt{x^2 + y^2}$. Sketch the solid, set up the integral, and then evaluate it. Show the important steps in the evaluation.