WRITTEN HOMEWORK #4, DUE FEB 3, 2010

If you want more practice with cylindrical coordinates without having to calculate integrals, look at Problems 1-16 of Chapter 16.7. If you want more practice with spherical coordinates, look at problems 1-16 of Chapter 16.8. Doing these problems on your own is strongly recommended; most of them are short so they won't take as long as you may initially think.

(1) (Chapter 16.6, Problem #16) Evaluate the triple integral $\iiint_T xyz\,dV$, where T is the solid tetrahedron with vertices $(0,0,0),(1,0,0),(1,1,0),(1,0,1)$.

(2) (Chapter 16.6, Problem #30) Express the integral $\iiint_E f(x,y,z)dV$ as an iterated integral in six different ways, where E is the solid bounded by $y^2+z^2=9, x=-2, x=2$.

(3) (Chapter 16.7, Problem #18) Evaluate $\iiint_E (x^3+xy^2)\,dV$, where E is the solid in the first octant that lies beneath the paraboloid $z=1-x^2-y^2$.

(4) (Chapter 16.7, Problem #28) Evaluate the following integral by changing to cylindrical coordinates:

$$\int_{-3}^{3}\int_{0}^{\sqrt{9-x^2}}\int_{0}^{9-x^2-y^2} \sqrt{x^2+y^2}\,dz\,dy\,dx.$$

(5) (Chapter 16.8, Problem #24) Evaluate $\iiint_E e^{\sqrt{x^2+y^2+z^2}}\,dV$, where E is enclosed by the sphere $x^2+y^2+z^2=9$ in the first octant.

(6) (Chapter 16.8, Problem #28) Find the average distance from a point in a ball of radius a to its center. (Recall that the average value of a function $f(x,y,z)$ on the region E is given by the expression

$$\frac{1}{V(E)}\iiint_E f(x,y,z)\,dV$$

where $V(E)$ is the volume of E.)