

**Math 215**  
**Homework Set 6: §§16.4 – 16.6**  
**Winter 2008**

Most of the following problems are modified versions of homework problems from your text book  
*Multivariable Calculus* by James Stewart.

16.4a. Do Problems 29–32 of §16.4 in Stewart's *Multivariable Calculus*.

16.4b. Use polar coordinates to evaluate

$$\int_0^6 \int_{-\sqrt{36-x^2}}^{\sqrt{36-x^2}} (x^3 + y^2x) dy dx.$$

16.5a. A thin lamina is formed by considering the region inside the circle  $x^2 + y^2 = 6y$  and outside the circle  $x^2 + y^2 = 9$ . Find the center of mass of the lamina if the density at any point (in grams per meter squared) is inversely proportional to its distance from the origin. Follow up question: why do we not care what the constant of proportionality is?

16.6a. Find the region  $E$  for which the triple integral

$$\iiint_E (6 - 3x^2 - 2y^2 - 2z^2) dV$$

is a maximum.

16.6b. Find the center of mass of the tetrahedron bounded by the planes  $x = 0$ ,  $y = 0$ ,  $z = 0$ ,  $x + 3y + 2z = 6$ ;  $\rho(x, y, z) = z$ .

16.6c. Sketch the region of integration for the integral

$$\int_0^3 \int_{9-x^2}^9 \int_0^{9-y} f(x, y, z) dz dy dx.$$

Rewrite this integral as an equivalent iterated integral in three of the five possible other orders.

16.6d. Find the center of mass of the cube given by  $-a \leq x \leq a$ ,  $-a \leq y \leq a$  and  $0 \leq z \leq 2a$ ;  $\rho(x, y, z) = x^2 + y^2 + z^2$ .

16.6e. Do Problems 33 and 34 of §16.6 in Stewart's *Multivariable Calculus*.