

**Math 215**  
**Homework Set 11: §17.9**  
**Winter 2008**

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

17.9a. Please do Problem 17 of §17.9 in Stewart's *Multivariable Calculus*.

17.9b Let  $\mathbf{r}(x, y, z) = \langle x, y, z \rangle$ . Compute the outward flux of  $\mathbf{F} = \mathbf{r}/|\mathbf{r}|^3$  through the ellipsoid  $4x^2 + 9y^2 + 6z^2 = 36$ . (Hint: Because  $\mathbf{F}$  is not continuous at zero, you cannot use the divergence theorem on the bounded region inside of  $S$ . However, you may wish to consider the region bounded between  $S$  and the sphere of radius 100.)

17.9c. Suppose that  $E$  is the unit cube in the first octant and  $\mathbf{F}(x, y, z) = \langle -x, y, z \rangle$ . Let  $S$  be the surface obtained by taking the surface of  $E$  without its top (so  $S$  has five sides). Calculate  $\iint_S \mathbf{F} \cdot d\mathbf{S}$  directly and by using the divergence theorem.

17.9d. Use the divergence theorem to evaluate

$$\iint_S (3x + 4y^2 + 2z) dS$$

where  $S$  is the sphere of radius 2 centered at the origin.