

**Math 215**  
**Homework Set 2: §§13.4 – 13.5, §13.7**  
**Winter 2008**

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

- 13.4a. Prove the law of cosines. (Hint: Follow the same rules as when you proved the Pythagorean theorem.)
- 13.4d. Find two unit vectors which are orthogonal to both  $\langle -3, 1, 5 \rangle$  and  $\langle 2, 3, 5 \rangle$ . Can you find any others?
- 13.4e. Problem 43 of §13.4 of Stewart's *Multivariable Calculus*. Think carefully about how should one define the distance from  $P$  to  $L$ .
- 13.5a. Problem 73 of §13.5 of Stewart's *Multivariable Calculus*. One approach to this problem is to find a line perpendicular to both planes and then measure the length of that part of the line that lies between the two planes.
- 13.5b. Suppose  $P$  is the plane described by the equation  $ax + by + cz + d = 0$ . Given two points  $(x_0, y_0, z_0)$  and  $(x_1, y_1, z_1)$ , how does one go about determining whether or not the two points lie on the same side of the plane. Carefully explain your reasoning.
- 13.5c. Find the equation of the line consisting of those points which are equidistant from the three points  $(1, 1, -3)$ ,  $(2, 4, -1)$ , and  $(-3, 1, -1)$ .
- 13.7a. A solid lies above the cone  $z = \sqrt{7(x^2 + y^2)}$  and inside the sphere  $x^2 + y^2 + z^2 = 8z$ . Using spherical coordinates, write a description of the solid.
- 13.7b. Sketch the solid or surface described by the following equations and inequalities.
- (a)  $0 \leq \varphi \leq \pi/3, \rho \leq 5$
  - (b)  $z - r^2 = 0$
  - (c)  $4 - \rho \sin \varphi = 0$
  - (d)  $r^2 \leq z \leq 2 - r^2$
  - (e)  $\rho^2 - 5\rho = -6$
  - (f)  $\pi/4 \leq \theta \leq 3\pi/4, z \leq r \leq 5$
  - (g)  $\theta = \pi/3$ .
- 14.1a. Problems 19-24 of §14.1 of Stewart's *Multivariable Calculus*.
- 14.1b. Find parametric equations which describe the curve defined by intersecting the cylinder  $r = 7$  with the paraboloid of revolution  $7z + (x^2 + y^2) = 0$ . Sketch the two surfaces and the curve of intersection.