Electricity & Magnetism I, Homework 1
Fall 2016, (Due Wednesday, Sept. 7, 2016)

1. Find the angle between the body diagonals of a cube.

2. Prove that $[\mathbf{A} \times (\mathbf{B} \times \mathbf{C})] + [\mathbf{B} \times (\mathbf{C} \times \mathbf{A})] + [\mathbf{C} \times (\mathbf{A} \times \mathbf{B})] = 0$. Under what conditions does $\mathbf{A} \times (\mathbf{B} \times \mathbf{C}) = (\mathbf{A} \times \mathbf{B}) \times \mathbf{C}$?

3. The vectors from the origin to the points A, B, C, D are

   $$\mathbf{A} = \mathbf{x} + \mathbf{y} + \mathbf{z}$$
   $$\mathbf{B} = 2\mathbf{x} + 3\mathbf{y}$$
   $$\mathbf{C} = 3\mathbf{x} + 5\mathbf{y} - 2\mathbf{z}$$
   $$\mathbf{D} = -\mathbf{y} + \mathbf{z}$$

   Show that the lines AB and CD are parallel and find the ratio of their lengths.

4. If $\mathbf{A}$ is a constant vector and $\mathbf{r}$ is the position vector(the vector from the origin to point (x,y,z), show that the following is the equation of a sphere:

   $$(\mathbf{r} - \mathbf{A}) \cdot \mathbf{r} = 0.$$

5. Problems 1.13, 1.20, 1.26