

# **HOMEWORK 1, MATH 175 - FALL 2009**

**DUE FRIDAY SEPTEMBER 4TH**

This homework assignment covers Sections 13.1 - 13.4 in the book.

1. Find an equation of the sphere which intersects the origin and whose center is  $(1, -1, 3)$ .
2. Find an equation describing all the points which are equidistant from the points  $(1, 1, 1)$  and  $(-1, -1, -1)$ , describe this set.
3. Find the unit vectors that are parallel to the tangent line to the parabola  $y = x^2$  at the point  $(2, 4)$ .
4. Find the orthogonal projection of the vector  $\mathbf{v} = (2, -1, 3)$  in the direction of the vector  $\mathbf{w} = (2, 1, 1)$ .
5. If  $\mathbf{r} = (x, y, z)$ ,  $\mathbf{a} = (2, 1, -1)$ , and  $\mathbf{b} = (1, 1, 0)$  then show that the equation  $(\mathbf{r} - \mathbf{a}) \cdot (\mathbf{r} - \mathbf{b}) = 0$  describes a sphere and find its center and radius.
6. Find all vectors  $\mathbf{v} = (v_1, v_2, v_3)$  such that  $\mathbf{i} \times (\mathbf{j} \times \mathbf{v}) = (\mathbf{i} \times \mathbf{j}) \times \mathbf{v}$ .
7. Find all vectors  $\mathbf{v} = (v_1, v_2, v_3)$  such that  $\mathbf{i} \cdot (\mathbf{j} \times \mathbf{v}) = (\mathbf{i} \times \mathbf{j}) \cdot \mathbf{v}$ .