Homework Assignment 1                   Due date: January 20th, 2010

1. Given points P(1, −3, 5), Q(2, 4, 6), and R(0, 3, 8), find:
   (a) the distance vector \( \vec{r}_{QR} \)   (b) the distance between Q and R
   (b) the angle between QP and QR   (d) the area of the triangle PQR
   (e) A vector parallel to PQ with magnitude of 10

2. Given \( \vec{A} = 2\hat{x} + \hat{y} - 3\hat{z} \), \( \vec{B} = \hat{y} - \hat{z} \), and \( \vec{C} = 3\hat{x} + 5\hat{y} + 7\hat{z} \), determine:
   (a) \( \vec{A} - 2\vec{B} + \vec{C} \)   (b) \( \frac{2\vec{A} - 3\vec{B}}{|\vec{C}|} \)
   (c) \( \vec{A} \cdot \vec{C} - |\vec{B}|^2 \)
   (d) \( \vec{A} \cdot \vec{B} \times \vec{C} \)   (e) \( \vec{A} \times \vec{B} \cdot \vec{C} \)
   (f) \( (\vec{A} \times \vec{B}) \times (\vec{B} \times \vec{C}) \)
   (g) the values of \( \alpha \) and \( \beta \) such that \( a\vec{A} + \beta\vec{B} + \vec{C} \) is parallel to the \( y \)-axis

3. Let \( \vec{E} = 3\hat{y} + 4\hat{z} \) and \( \vec{F} = 4\hat{x} - 10\hat{y} + 5\hat{z} \). Find both the scalar and vector components of \( \vec{E} \) along \( \vec{F} \). Also, determine a unit vector perpendicular to both \( \vec{E} \) and \( \vec{F} \).

4. Let \( \vec{Q} = (2x - y)\hat{x} + (4y + z)\hat{y} + (4x - 2z)\hat{z} \).
   (a) Determine a unit vector in the direction of \( \vec{Q} \) at P(1, 2, 1).
   (b) Find the component of \( \vec{Q} \) at P in the direction of PT where T is the point (5, 3, −4).
   (c) At which coordinate is \( \vec{Q} \) the same as the unit vector along \( \hat{x} + 11\hat{y} + 10\hat{z} \)?

Reading Assignment:  Chapter 2