ELEC 318 Electromagnetic Fields   **HW #1, due January 22, 2015**

Reading Assignment: Chapter 3 (all)

Written Assignment:

1. Determine the unit vector along the direction OP, where O is the origin and P is the point $(4, -5, 1)$.

2. If $\mathbf{A} = 4\hat{\mathbf{x}} - 2\hat{\mathbf{y}} + 6\hat{\mathbf{z}}$ and $\mathbf{B} = 12\hat{\mathbf{x}} + 18\hat{\mathbf{y}} - 8\hat{\mathbf{z}}$, determine

   (a) $\mathbf{A} - 3\mathbf{B}$
   (b) $\left(2\mathbf{A} + 5\mathbf{B}\right) / |\mathbf{B}|$,
   (c) $\hat{\mathbf{x}} \times \mathbf{A}$
   (d) $\left(\mathbf{B} \times \hat{\mathbf{x}}\right) \cdot \hat{\mathbf{y}}$

3. For the following vectors, determine (a) the dot product of $\mathbf{P}$ and $\mathbf{Q}$, (b) the cross product of $\mathbf{P}$ and $\mathbf{Q}$, and (c) the angle between $\mathbf{P}$ and $\mathbf{Q}$.

$$\mathbf{P} = 2\hat{\mathbf{x}} - 6\hat{\mathbf{y}} + 5\hat{\mathbf{z}} \qquad \mathbf{Q} = 3\hat{\mathbf{y}} + \hat{\mathbf{z}}$$

4. Let $\mathbf{A} = 2x\,\hat{\mathbf{x}} + y\,\hat{\mathbf{y}} - z^2\hat{\mathbf{z}}$ and $\mathbf{B} = 3x^2\,\hat{\mathbf{x}} + 6\,\hat{\mathbf{y}} + \hat{\mathbf{z}}$. At point $(1, 2, -4)$, determine

   (a) the dot product of $\mathbf{A}$ and $\mathbf{B}$,
   (b) the angle between $\mathbf{A}$ and $\mathbf{B}$, and
   (c) the vector component of $\mathbf{A}$ in the direction of $\mathbf{B}$.

5. For $\mathbf{E} = 2x\,\hat{\mathbf{x}} + \hat{\mathbf{y}} + yz\,\hat{\mathbf{z}}$ and $\mathbf{F} = xy\,\hat{\mathbf{x}} - y^2\,\hat{\mathbf{y}} + xyz\,\hat{\mathbf{z}}$, determine

   (a) the magnitude of $\mathbf{E}$ at $(1, 2, 3)$,
   (b) the vector component of $\mathbf{E}$ in the direction of $\mathbf{F}$ at $(1, 2, 3)$, and
   (c) a vector perpendicular to both $\mathbf{E}$ and $\mathbf{F}$ at $(0, 1, -3)$ whose magnitude is one.