Homework # 2

1) Find the angle (in radians)   between the vectors $\mathbf{a} = 6\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}$ and
   $\mathbf{b} = 2\mathbf{i} + \mathbf{j} - 2\mathbf{k}$.

2) Suppose $\mathbf{a}$ and $\mathbf{b}$ are nonzero vectors .
   a) Under what conditions would $\text{comp}_a\, \mathbf{b}\ =\ \text{comp}_b\, \mathbf{a}$?

   b) Under what conditions would $\text{proj}_a\, \boldsymbol{b}\ =\ \text{proj}_b\, \mathbf{a}$?

3) Write the vector $\mathbf{b}\ =\ 3\mathbf{j} + 4\mathbf{k}$ as the sum of two vectors , $\mathbf{a}_1\ +\ \mathbf{a}_2$, where
    $\mathbf{a}_1$ is parallel to the vector $\mathbf{i} + \mathbf{j}$ and $\mathbf{a}_2$ is orthogonal to $\mathbf{i} + \mathbf{j}$.

4) Find two unit vectors which are orthogonal to both $\mathbf{a} = <1\,,1\,,0>$ and
   and $\mathbf{b}\ =\ <1\,,-1\,,1>$.

5) a) Find a vector orthogonal to the plane containing the points P(2,0, -3) ,
       Q(3,1,0) and R(5,2,2) .
   b)   Find the area of the triangle   PQR .

6) Find the volume of the parallelepiped determined by the   vectors
    $\mathbf{a} = <2,3, -2>$, $\mathbf{b}\ =\ <1\,,-1\,,0>$ and $\mathbf{c} = <2,0,3>$.