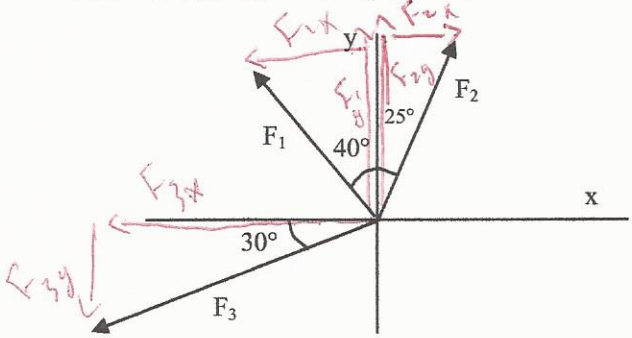
Physics 225

Fall 2014

Problem Set # 3

Note: **Bold face** type implies vectors.

1) Given three vectors; $F_1 = 35$, $F_2 = 40$, $F_3 = 80$ (see the diagram for the angles), find the resultant vector of all three using the component method.



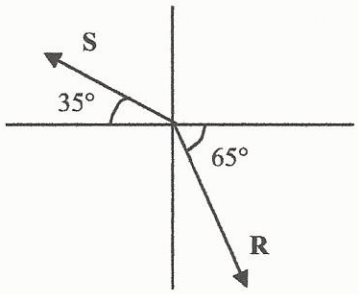
2) Repeat Problem # 1 using unit vectors. Make sure you write out each vector using unit vectors first and show ALL of your work.

3) Using the vectors $\mathbf{F_1}$ and $\mathbf{F_2}$ from Problem # 1, find the following, leaving your answers in unit vector notation.
   a) $\mathbf{F_1} - \mathbf{F_2}$
   b) $2\mathbf{F_2} - \mathbf{F_1}$
   c) $F_1 + F_2$
   d) $F_2 F_1$
   e) $F_2 (\mathbf{F_1} + \mathbf{F_2}) / F_1$

4) For the vector $\mathbf{A} = -8\mathbf{j} + 4\mathbf{k}$, find its magnitude and direction. Also state in what plane the vector resides.

5) Given the vector: $\mathbf{A} = 3\mathbf{i} + 4\mathbf{j}$, find any three vectors **B** that also lie in the xy plane and have the property that $A = B$ but $\mathbf{A} \neq \mathbf{B}$. Write out these vectors with unit vector notation.

6) Given two vectors; $S = 2.5$, $R = 4.2$, (see the diagram for the angles), find the dot product using (a) the magnitudes and (b) unit vector notation.



7) Calculate the angle between the two vectors given by: $\mathbf{b} = 3\mathbf{i} - 2\mathbf{j} - 8\mathbf{k}$, $\mathbf{c} = \mathbf{i} - 5\mathbf{j} + 4\mathbf{k}$.

8) Determine if the following vectors are perpendicular to each other.
   a) $\mathbf{P} = 3\mathbf{i} - 2\mathbf{j} + \mathbf{k}$, $\mathbf{Q} = 4\mathbf{i} + 9\mathbf{j} + 6\mathbf{k}$.
   b) $\mathbf{D} = \mathbf{i} + 2\mathbf{j} - 5\mathbf{k}$, $\mathbf{F} = 2\mathbf{i} - 7\mathbf{j} + \mathbf{k}$.

9) Determine the vector product of each set of vectors.
   a) $\mathbf{P} = 3\mathbf{i} - 2\mathbf{j} + \mathbf{k}$, $\mathbf{Q} = 4\mathbf{i} + 9\mathbf{j} + 6\mathbf{k}$.
   b) $\mathbf{D} = \mathbf{i} + 2\mathbf{j} - 5\mathbf{k}$, $\mathbf{F} = 2\mathbf{i} - 7\mathbf{j} + \mathbf{k}$.

1) 78.4, 17.1°
3) a) $-39.4\mathbf{i} - 9.5\mathbf{j}$
   b) $56.3\mathbf{i} + 45.8\mathbf{j}$
   c) 75
   d) $-900\mathbf{i} + 1072\mathbf{j}$
   e) $-6.4\mathbf{i} + 72.1\mathbf{j}$
4) 8.94, 26.6°, yz plane
6) −9.09
7) 109.5°
8) a) Perp.
   b) Not Perp.
9) a) $-21\mathbf{i} - 14\mathbf{j} + 35\mathbf{k}$
   b) $-33\mathbf{i} - 11\mathbf{j} - 11\mathbf{k}$