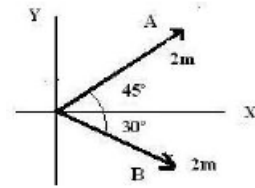# VECTOR CALCULUS

1. Given the vectors $\vec{A}$ and $\vec{B}$, determine:
   a. Their cartesian coordinates
   b. The vectors: $\vec{A} + \vec{B}; \quad \vec{A} - \vec{B}; \quad \vec{B} - \vec{A}; \quad 2\vec{A} - \vec{B}$
   c. Graphically, the vectors of part b.



2. A vector $\vec{A}$ has a magnitude of 8 m and makes an angle of 37º with the OX axis. Also consider the vectors $\vec{B} = 3\vec{\imath} - 5\vec{\jmath}$ and $\vec{C} = -6\vec{\imath} + 3\vec{\jmath}$. Determine the vectors: $\vec{A} + \vec{C}; \quad \vec{A} - 2\vec{B}; \quad \vec{A} - 2\vec{B} + 3\vec{C}; \quad \vec{A} \cdot \vec{B}; \vec{A} \times \vec{B}; \quad \vec{B} \cdot \vec{C}; \quad 2\vec{A} \times \vec{C}.$

3. Calculate the magnitude and direction of the following vectors: $\vec{A} = 4\vec{\imath} + 3\vec{\jmath}; \vec{B} = 10\vec{\imath} - 7\vec{\jmath}; \vec{A} + \vec{B}; \vec{A} \times \vec{B}.$

4. Determine the following vectors, in terms of $\vec{\imath}$ and $\vec{\jmath}$:
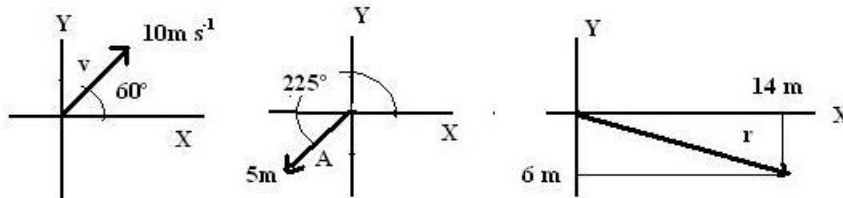


5. The cartesian components of a vector are: $A_x = -10$ and $A_y = 6$, $\vec{B} = 3\vec{\imath} + 5\vec{\jmath}$ and $\vec{C} = 3\vec{\imath} + 4\vec{\jmath}$. Calculate:
   a. The angle that the vector $\vec{A}$ makes with the positive OX axis.
   b. The angle between the vectors $\vec{A}$ and $\vec{B}$.
   c. The unitary vector of $\vec{C}$.
   d. The projection of $\vec{A}$ in the direction of $\vec{C}$.