2. a. If $\vec{A}$ and $\vec{B}$ are non-zero vectors, is it possible for $\vec{A}.\vec{B}$ *and* $\vec{A}X\vec{B}$ both to be zero? Explain.
   b. A disoriented physics professor drives 3.25 km north, then 4.75 km west and then 1.50 km south. Find the magnitude and direction of the resultant displacement.
3. a. Resultant of two equal forces may have the magnitude equal to one of the forces. At what angle between them the two equal forces this is possible.
   b. A rocket fires two engine simultaneously. One produces a thrust of 725N directly forward while the other gives a 513N thrust at 32.4^0 above the forward direction. Find the magnitude and direction of the resultant force that these engines exert on the rocket.
4. The magnitudes of two vectors are equal and the angle between them is θ. Show that their resultant divides angle θ equally.
   b. A force vector is given as $\vec{F}_1 = (4\hat{\imath} + 3\hat{\jmath})N$. Find the vector $\vec{F}_2$ of magnitude 10N which is perpendicular to $\vec{F}_1$.

5. a. The velocity of 20 m/s has its x-component 12 m/s. What is its y-component? Find the angle at which the velocity is inclined with the x-axis.
   b. Find the value of λ if the vectors $\vec{A} = 2\hat{\imath} + \hat{\jmath} + \hat{k}$ and $\vec{B} = \hat{\imath} + 4\hat{\jmath} + \lambda\,\hat{k}$ are mutually perpendicular.
   c. Is a pressure and electric current are vector quantity?

6. a. If the cross product of two vectors vanishes, what can you say about their directions?
   b. State triangle law of vector addition. Obtain the expression for the resultant of two vectors P and Q inclined at an angle θ.
   c. After an aeroplane takes off, it travels 12 km west, 4 km north and 3 km up. Haw far t is from the take off point?

7. a. What does for $\vec{A}.\vec{A}$, the scalar product with itself gives? What about $\vec{A} \times \vec{A}$?
   b. State parallelogram law of vector addition. Obtain the expression for the resultant of two vectors P and Q inclined at an angle θ.
   c. Show that the vectors, $(\hat{\imath} + 2\hat{\jmath} + 3\hat{k})$ & $(2\hat{\imath} - \hat{\jmath})$ are perpendicular to each other.
   d. Show that the vectors, $(\hat{\imath} + 2\hat{\jmath} + 3\hat{k})$ & $(2\hat{\imath} + 4\hat{\jmath} + 6\hat{k})$ are parallel to each other.

8. a. Can the walk of a man be an example of resolution of vector? *(Yes, when a man walks, he pushes the ground with his foot. In return, an equal and opposite reaction act, on his foot. The reaction is resolved in two components i.e. horizontal and vertical components)*
   b. A spelunker is surveying a cave. She follows a passage 180m straight west, then 210m in a direction 45^0 east of south, and 280m at 30^0 east of north. After the fourth unmeasured displacement, find herself back where she started. Find the magnitude and direction of fourth displacement.

9. a. What is the scalar product of a vector with itself? What about vector product?
   b. At what angle the two forces $\overrightarrow{(P+Q)}$ and $\overrightarrow{(P-Q)}$ act, so that the resultant is $\sqrt{3P^2+Q^2}$
   c. Given two vectors $\vec{A} = 4\hat{\imath} + 3\hat{\jmath}$ & $\vec{B} = 5\hat{\imath} - 2\hat{\jmath}$, write an expression for the vector difference $\vec{A} - \vec{B}$ using unit vectors, and find the magnitude and direction of the vector difference $\vec{A} - \vec{B}$.
10. a. Two vectors $\vec{A}$ and $\vec{B}$ are such that $\vec{A} - \vec{B} = \vec{C}$ and $A - B = C$. Find the angle between them.
    b. If B is added to A, under what condition does the resultant vector have a magnitude equal to A+B? Under what conditions is the resultant vector equal to zero?
    c. Can you find a vector quantity that has a magnitude of zero but components that are different from zero? Explain.