Prabhu Jagatbandhu College
Department of Mathematics
$\left(\text{Assignment-1,Maths(Hons) 1}^{\text{st}}\text{ year,2017}\right)$

(Vector Algebra)

1. Prove that the straight line joining the mid-points of the two non-parallel sides of a trapezium is parallel to the parallel sides and half of their sum.

2. ABCD is a parallelogram. P and Q are the mid-points of the sides AB and CD respectively. Show that DP and BQ trisect AC and are trisected by AC.

3. If the mid-points of of the consecutive sides of any quadrilateral be connected by st lines, then show that the resulting quadrilateral is a parallelogram.

4. Show the Medians of a triangle divides in 2:1 ratio.

5. Show that the vector area of the plane quadrilateral ABCD is $\frac{1}{2}(\overrightarrow{AC}\times\overrightarrow{BD})$. Show further that if

   $\overrightarrow{AB}=\vec{b},\overrightarrow{AD}=\vec{d} \qquad \overrightarrow{AC}=m\vec{b}+n\vec{d}$ then the vector area of ABCD is $\frac{1}{2}(m+n)(\vec{b}\times\vec{d})$

6. If $\vec{\alpha},\vec{\beta},\vec{\gamma}$ are three vectors such that sum of them is zero and magnitudes are 3, 5, 7 respectively; find the angle between $\vec{\alpha}$ and $\vec{\beta}$.

7. Find a unit vector parallel to the xy-plane and perpendicular to the vector $4\hat{i}-3\hat{j}+\hat{k}$.

8. If $\vec{\alpha}$ be resolved into two components, one in the direction of unit vector $\hat{e}$ and another perpendicular to $\hat{e}$, then find the components.

9. In any triangle ABC, with usual notation, show $a\cos B-b\cos A=(a^2-b^2)/c$.

10. The position vector of the vertices of a triangle are $\vec{0}$, $\vec{a}$, $\vec{b}$ and its area is Δ then show that
    $$4\Delta^2=|\vec{a}|^2\,|\vec{b}|^2-(\vec{a}\cdot\vec{b})^2$$

Date: 05/12/2017