Chapter: Vectors (EE117)　　　　　　　　　　　　**Worksheet#1c. (Sec: ___)**

Q1. (a) Find the position vectors r_1 and r_2 for the points P (2, 4, 3) and Q (1, -5, 2) of a rectangular coordinate system in terms of the unit vectors $\hat{\imath}, \hat{\jmath}, \hat{k}$. (b) Determine graphically and analytically the resultant of these position vectors.

Q2. Given $\mathbf{r_1} = 3\hat{\imath} - 2\hat{\jmath} + \hat{k}$, $\mathbf{r_2} = 2\hat{\imath} - 4\hat{\jmath} - 3\hat{k}$, $\mathbf{r_3} = -\hat{\imath} + 2\hat{\jmath} + 2\hat{k}$, find the magnitudes of
　　(a) $\mathbf{r_3}$, (b) $\mathbf{r_1} + \mathbf{r_2} + \mathbf{r_3}$, (c) $\mathbf{2r_1} - \mathbf{3r_2} - \mathbf{5r_3}$.

Q3. Find a unit vector parallel to the resultant of vectors $\mathbf{r_1} = 2\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$, $\mathbf{r_2} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k}$.

Q4. Determine the vector having initial point P (x_1, y_1, z_1) and terminal point Q (x_2, y_2 , z_2) and find its magnitude.

Q5. If $\mathbf{A} = 3\hat{\imath} - \hat{\jmath} - 4\hat{k}$, $\mathbf{B} = -2\hat{\imath} + 4\hat{\jmath} - 3\hat{k}$, $\mathbf{C} = \hat{\imath} + 2\hat{\jmath} - \hat{k}$, find (a) $2\mathbf{A} - \mathbf{B} + 3\mathbf{C}$, (b) $|\mathbf{A} + \mathbf{B} + \mathbf{C}|$, (c)$|3\mathbf{A} - 2\mathbf{B} + 4\mathbf{C}|$, (d) a unit vector parallel to $3\mathbf{A} - 2\mathbf{B} + 4\mathbf{C}$

Q6. The following forces act on a particle P : $\mathbf{F_1} = 2\hat{\imath} + 3\hat{\jmath} - 5\hat{k}$, $\mathbf{F_2} = -5\hat{\imath} + \hat{\jmath} + 3\hat{k}$, $\mathbf{F_3} = \hat{\imath} - 2\hat{\jmath} + 4\hat{k}$, $\mathbf{F_4} = 4\hat{\imath} - 3\hat{\jmath} - 2\hat{k}$, measured in pounds. Find (a) the resultant of the forces, (b) the magnitude of the resultant.

Q7. Find the work done in moving an object along a vector $\mathbf{r} = 3\hat{\imath} + 2\hat{\jmath} - 5\hat{k}$ if the applied force is $\mathbf{F} = 2\hat{\imath} - \hat{\jmath} - \hat{k}$.

Q8. If $\mathbf{A} = 2\hat{\imath} - 3\hat{\jmath} - \hat{k}$ and $\mathbf{B} = \hat{\imath} + 4\hat{\jmath} - 2\hat{k}$, find (a) $\mathbf{A} \times \mathbf{B}$, (b) $\mathbf{B} \times \mathbf{A}$, (c) $(\mathbf{A} + \mathbf{B}) \times (\mathbf{A} - \mathbf{B})$.

Q9. Determine a unit vector perpendicular to the plane of $\mathbf{A} = 2\hat{\imath} - 6\hat{\jmath} - 3\hat{k}$ & $\mathbf{B} = 4\hat{\imath} + 3\hat{\jmath} - \hat{k}$.

Q10a. Evaluate: (a) $\hat{k} \, (\hat{\imath} + \hat{\jmath})$, (b) $(\hat{\imath} - 2\hat{k}) \, (\hat{\jmath} + 3\hat{k})$, (c) $(2\hat{\imath} - \hat{\jmath} + 3\hat{k}) \, (3\hat{\imath} + 2\hat{\jmath} - \hat{k})$.

Q10b. For what values of a are $\mathbf{A} = a\hat{\imath} - 2\hat{\jmath} + \hat{k}$ and $\mathbf{B} = 2a\hat{\imath} + a\hat{\jmath} - 4\hat{k}$ perpendicular.

Q11. Show that A = (2i - 2j + k)/3, B = (i + 2j + 2k)/3 and C = (2i + j - 2k)/3 are mutually orthogonal unit vectors.

Q12. Find the work done in moving an object along a straight line from (3,2,-1) to (2,-1,4) in a force field given by F = $4\hat{\imath} - 3\hat{\jmath} + 2\hat{k}$.

Q13. Evaluate each of the following:

　　(a) $2\hat{\jmath} \times (3\hat{\imath} - 4\hat{k})$, (b) $(\hat{\imath} + 2\hat{\jmath}) \times \hat{k}$, (c) $(2\hat{\imath} - 4\hat{k}) \times (\hat{\imath} + 2\hat{\jmath})$
　　(b) $(4\hat{\imath} + \hat{\jmath} - 2\hat{k}) \times (3\hat{\imath} + \hat{k})$,
　　(c) $(2\hat{\imath} + \hat{\jmath} - \hat{k}) \times (3\hat{\imath} - 2\hat{\jmath} + 4\hat{k})$.

Q14. Find the area of a parallelogram having diagonals $A = 3\hat{\imath} + \hat{\jmath} - 2\hat{k}$ and $B = \hat{\imath} - 3\hat{\jmath} + 4\hat{k}$.

Q15. If A = $\hat{\imath} - 2\hat{\jmath} - 3\hat{k}$, B = $2\hat{\imath} + \hat{\jmath} - \hat{k}$ and C = $\hat{\imath} + 3\hat{\jmath} - 2\hat{k}$, find:

　(a) $|(A \times B) \times C |$　(b) A (B×C)　　(c) (A×B) × (B×C)