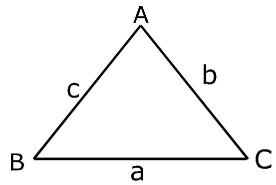
EXERCISE – V

HINTS & SOLUTIONS

Sol.1

(i)



Area = $\frac{1}{2}(\vec{a}\times\vec{b}) = \frac{1}{2}(\vec{b}\times\vec{c}) = \frac{1}{2}(\vec{c}\times\vec{a})$

(ii) Normal vector of P_1 = $\vec{a}\times\vec{b}$

Normal vector of P_2 = $\vec{c}\times\vec{d}$

given that $(\vec{a}\times\vec{b})$ × $(\vec{c}\times\vec{d})$ = 0

that means $\vec{P}_1$ is parallel to $\vec{P}_2$

so angle = 0º

(iii) $|\vec{a}| = |\vec{b}| = |\vec{c}|$

$[\vec{a}\ \vec{b}\ \vec{c}] = 0$ (given)

$[2\vec{a}-\vec{b} \quad 2\vec{b}-\vec{c} \quad 2\vec{c}-\vec{a}]$

$(2\vec{a}-\vec{b}).[(2\vec{b}-\vec{c})\times(2\vec{c}-\vec{a})]$

$= (2\vec{a}-\vec{b}).[4(\vec{b}\times\vec{c})-(\vec{b}\times\vec{a})+(\vec{c}\times\vec{a})]$

$= 8[\vec{a}\ \vec{b}\ \vec{c}] - 0 + 0 - 0 - 0 - [\vec{b}\ \vec{c}\ \vec{a}] = 0$

Sol.2 (i) $\vec{a}$ = (1, 1, –1); $\vec{b}$ = (–1, 2, 2);

$\vec{c}$ = (-1, 2, -1)

$\vec{a}+\vec{b}$ = (0, 3, 1); $\vec{b}-\vec{c}$ = (0, 0, 3)

Normal vector = $\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 3 & 1 \\ 0 & 0 & 3 \end{vmatrix}$

$= 9\hat{i} - 0\hat{j} + 0\hat{k}$

unit normal vector = ± $\hat{i}$

(ii) $\vec{a}.\vec{b} = 0$

so, $\vec{a}$, $\vec{b}$ and $\vec{a}\times\vec{b}$ are perpendicular to each other.

$\vec{V} = p\vec{a} + q\vec{b} + r(\vec{a}\times\vec{b})$

$\vec{V}.\vec{a} = 0 \Rightarrow p(\vec{a}.\vec{a}) = 0 \Rightarrow p = 0$

$\vec{V}.\vec{b} = 1 \Rightarrow 0 + q\ |\ b\ |^2 + 0 = 1$

$\Rightarrow q = \frac{1}{|b|^2}$

$\vec{V}.(\vec{a}\times\vec{b}) = p.0 + q.0 + r|\vec{a}\times\vec{b}|^2$

$\Rightarrow \frac{[\vec{a}\ \vec{b}]}{|\vec{a}\times\vec{b}|^2} = \frac{1}{|\vec{a}\times\vec{b}|^2}$

$\vec{V} = \frac{\vec{b}}{|b|^2} + \frac{(\vec{a}\times\vec{b})}{|\vec{a}\times\vec{b}|^2}$

(iii) $\vec{a}\times(\vec{b}\times\vec{c}) = \vec{b}+\vec{c}$

$(\vec{a}.\vec{c})\vec{b} - (\vec{a}.\vec{b})\vec{c} = \frac{1}{2}(\vec{b}+\vec{c})$

$\vec{a}.\vec{c} = \frac{1}{2} \qquad \vec{a}.\vec{b} = -\frac{1}{2}$

$|\ a\ |\ |\ b\ | \cos\theta = \frac{-1}{2}$

$\Rightarrow \cos\theta = \frac{-1}{2} \Rightarrow \theta = \frac{2\pi}{3}$ Ans.

Sol.3 (a) $\vec{d}_1$ = (2, 3, –6) ; $\vec{d}_2$ = (3, –4, –1)

Area = $\frac{1}{2}\ |\vec{d}_1\times\vec{d}_2| = \frac{1}{2}\sqrt{1274}$

If sides are $\vec{a}$ and $\vec{b}$

$\vec{d}_1 = \vec{a}+\vec{b}$; $\qquad \vec{d}_2 = \vec{a}-\vec{b}$

$\vec{a} = \frac{\vec{d}_1+\vec{d}_2}{2}$; $\qquad \vec{b} = \frac{\vec{d}_1-\vec{d}_2}{2}$

$= \frac{1}{2}$ (5, –1, –7) $\qquad = \frac{1}{2}$(–1, 7, –5) Ans.

(b) (–4, 5, 0) a + (3, –3, 1) b + (1, 1, 3) c = λ (a, b, c)

$(-4a + 3b + c - \lambda a)\hat{i} + (5a - 3b + c - \lambda b)\hat{j}$

$+ (b + 3c - \lambda c)\hat{k} = 0$

$\ell\hat{i} + m\hat{j} + n\hat{k} = 0$

$\ell = m = n = 0$

$-4a + 3b + c - \lambda a = 0$

$5a - 3b + c - \lambda b = 0$

$b + 3c - \lambda c = 0$

again $(-4 - \lambda)a + 3b + c = 0$

$5a + (-3 - \lambda)b + c = 0$

$0a + b + (3 - \lambda)c = 0$

$$\begin{vmatrix} -4-\lambda & 3 & 1 \\ 5 & -3\lambda & 1 \\ 0 & b & 3-\lambda \end{vmatrix} = 0 \Rightarrow \lambda = 0,\ -2 \pm \sqrt{29}$$

Sol.4 (a) $\vec{r} = \lambda(\vec{a} \times \vec{b})$ $\quad \vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -2 & 5 \\ 2 & 3 & -1 \end{vmatrix}$

$\vec{r} = \lambda(-13, -11, 7)$

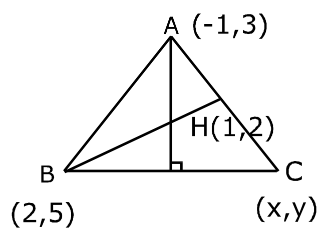
$= \hat{i}\,(2 - 15) - \hat{j}\,(-1 - 10) + \hat{k}\,(3 + 4)$

$= -13\hat{i} + 11\hat{j} + 7\hat{k}$

$\vec{r} \cdot (2\hat{i} - \hat{j} + \hat{k}) + 8 = 0$

$\lambda = 1$ so $\vec{r} = (-13, -11, 7)$

(b) H is orthocentre



$\overrightarrow{AH} \cdot \overrightarrow{BC} = 0$

$(2, -1) \,,\, (x - 2, y - 5) = 0$

$2x - y + 1 = 0 \qquad \ldots (1)$

$\overrightarrow{BH} \cdot \overrightarrow{AC} = 0$

$(-1, -3) \cdot (x + 1, y - 3) = 0$

$-x - 1 - 3y + 9 = 0$

$x + 3y = 8 \qquad \ldots (2)$

from(1) and (2) $x = \dfrac{5}{7}$; $y = \dfrac{17}{7}$

$C\left(\dfrac{5}{7}, \dfrac{17}{7}\right)$

Sol.5 (a) $(\vec{a} + \vec{b} + \vec{c})^2 = \sum \vec{a}^2 + 2\sum \vec{a} \cdot \vec{b} \geq 0$

$2\sum \vec{a} \cdot \vec{b} \geq -3 \;(\because |\vec{a}| = |\vec{b}| = |\vec{c}| = 1)$

$\sum |\vec{a} - \vec{b}|^2 = 2\sum \vec{a}^2 - 2\sum \vec{a} \cdot \vec{b}$

$\leq 2(3) + 3 \leq 9$

(b) $[\vec{a}\,\vec{b}\,\vec{c}] = \begin{vmatrix} 1 & 0 & -1 \\ x & 1 & 1-x \\ y & x & 1+x-y \end{vmatrix}$

Applying $C_3 \rightarrow C_1 + C_3$

$= \begin{vmatrix} 1 & 0 & 0 \\ x & 1 & 1 \\ y & x & 1+x \end{vmatrix} = 1$

Sol.6 $\vec{A}(t)$ is parallel to $\vec{B}(t)$ only if

$\dfrac{f_1(t)}{g_1(t)} = \dfrac{f_2(t)}{g_2(t)}$ for some $t \in [0, 1]$

or $f_1(t) \cdot g_2(t) = f_2(t) \cdot g_1(t)$

let $h(t) = f_1(t) \cdot g_2(t) - f_2(t) \cdot g_1(t)$

$h(0) = 2 \times 2 - 3 \times 3 = -5 < 0$

$h(1) = f_1(1) \cdot g_2(1) - f_2(1) \cdot g_1(1)$

$= 6 \times 6 - 2 \times 2 = 32 > 0$

Since, h is a continuous function and $h(0).h(1) < 0$

$\Rightarrow$ there is some $t \in [0, 1]$ for which $-h(t) = 0$

Sol.7 (a) $(\vec{a} + 2\vec{b}) \cdot (5\vec{a} - 4\vec{b}) = 0$

$5\,|a|^2 - 4\vec{a} \cdot \vec{b} + 10\,\vec{b} \cdot \vec{a} - 8\,|b|^2 = 0$

$6\,\vec{a} \cdot \vec{b} = 3 \Rightarrow \vec{a} \cdot \vec{b} = \dfrac{1}{2}$

$\Rightarrow \cos\theta = \dfrac{1}{2} \Rightarrow \theta = 60^\circ$

(b) $\vec{v} = (2, 1, -1) \qquad \vec{w} = (1, 0, 3)$

$[\vec{u}\,\vec{v}\,\vec{w}] = \vec{u} \cdot (\vec{v} \times \vec{w})$

$= \vec{u} \cdot (3, -7, -1) = \vec{u} \cdot |\,3, -7, -1\,| \cos\theta$

Maximum value of box product

$= |\,3, -7, -1\,| = \sqrt{9 + 49 + 1} = \sqrt{59}$

Sol.8 $[\vec{a}\,\vec{b}\,\vec{c}] = \begin{vmatrix} 1 & a & 1 \\ 0 & 1 & a \\ a & 0 & 1 \end{vmatrix} = a + a^3 - a$

$f(a) = a^3 - a + 1$

$f'(a) = 3a^2 - 1 = 0 \Rightarrow a = \pm \frac{1}{\sqrt{3}}$

minimum value of cubic in real line can't be determine

Sol.9 $\vec{x} = \frac{\vec{u}+\vec{v}}{|\vec{u}+\vec{v}|} = \frac{1}{2}\sec\frac{\alpha}{2}(\vec{u}+\vec{v})$

$\vec{y} = \frac{\vec{v}+\vec{w}}{|\vec{v}+\vec{w}|} = \frac{1}{2}\sec\frac{\beta}{2}(\vec{v}+\vec{w})$

$\vec{z} = \frac{\vec{w}+\vec{u}}{|\vec{w}+\vec{u}|} = \frac{1}{2}\sec\frac{\gamma}{2}(\vec{w}+\vec{u})$

since $[\vec{x}\times\vec{y} \quad \vec{y}\times\vec{z} \quad \vec{z}\times\vec{x}] = [\vec{x} \ \ \vec{y} \ \ \vec{z}]^2$

$= \frac{1}{64}\sec^2\frac{\alpha}{2}\sec^2\frac{\beta}{2}\sec^2\frac{\gamma}{2}[\vec{u}+\vec{v} \ \ \vec{v}+\vec{w} \ \ \vec{w}+\vec{u}]^2$ ...(1)

$[\vec{u}+\vec{v} \quad \vec{v}+\vec{w} \quad \vec{w}+\vec{u}]^2 = 2[\vec{u} \ \ \vec{v} \ \ \vec{w}]$

$[\vec{x}\times\vec{y} \quad \vec{y}\times\vec{z} \quad \vec{z}\times\vec{x}] =$

$= \frac{1}{64}\sec^2\frac{\alpha}{2}\sec^2\frac{\beta}{2}\sec^2\frac{\gamma}{2} \times 4[\vec{u} \ \ \vec{v} \ \ \vec{w}]^2$

$= \frac{1}{16}\sec^2\frac{\alpha}{2}\sec^2\frac{\beta}{2}\sec^2\frac{\gamma}{2}[\vec{u} \ \ \vec{v} \ \ \vec{w}]^2$

Sol.10 (a) Let $\vec{a} = (5, 2, 6)$

$\vec{b} = (2, 1, 1)$

$\vec{c} = (1, -1, 1)$

Required unit vector will be along $= \vec{a}\times(\vec{b}\times\vec{c})$

$\vec{a}\times(\vec{b}\times\vec{c}) = 27\hat{j} - 9\hat{k} \Rightarrow$ unit vector $= \frac{3\hat{j}-\hat{k}}{\sqrt{10}}$

(b) $\vec{a} = (1, 1, 1)$ $\ \vec{a}.\vec{b} = 1$

$\vec{a} \times \vec{b} = \hat{j} - \hat{k}$

$\vec{a} \times (\vec{a} \times \vec{b}) = (\vec{a}.\vec{b})\vec{a} - (\vec{a}.\vec{a})\vec{b}$

$(\hat{i}+\hat{j}+\hat{k}) \times (\hat{j}-\hat{k}) = \vec{a} - 3\vec{b}$

$-2\hat{i}+\hat{j}+\hat{k} = \hat{i}+\hat{j}+\hat{k} - 3\vec{b}$

$\vec{b} = \hat{i}$

Sol.11 $\vec{a}\times\vec{b} = \vec{c}\times\vec{d}$ and $\vec{a}\times\vec{c} = \vec{b}\times\vec{d}$

$(\vec{a}\times\vec{b}) - (\vec{a}\times\vec{c})$ and $(\vec{c}\times\vec{d}) - (\vec{b}\times\vec{d})$

$\vec{a}\times(\vec{b} - \vec{c}) = (\vec{c} - \vec{b})\times\vec{d}$

$\vec{a}\times(\vec{b} - \vec{c}) - (\vec{c} - \vec{b})\times\vec{d} = 0$

$\vec{a}\times(\vec{b} - \vec{c}) - \vec{d}\times(\vec{b} - \vec{c}) = 0$

$(\vec{a} - \vec{d})\times(\vec{b}\times\vec{c}) = 0$

$\vec{a} - \vec{d}$ is || to $(\vec{b} - \vec{c})$

$(\vec{a} - \vec{d}).(\vec{b} - \vec{c}) \neq 0$

$\vec{a}.\vec{b} + \vec{d}.\vec{c} \neq \vec{d}.\vec{b} + \vec{a}.\vec{c}$

Sol.12 $\vec{a}$ is external angle

Bisector of $\hat{v}$ and $\hat{w}$ $\ \therefore\ \hat{w} - \hat{v} = \lambda\hat{a}$

Take modulus $|\hat{w} - \hat{v}|^2 = \lambda^2|\hat{a}|^2$

$1 + 1 - 2\,\hat{w}.\hat{v} = \lambda^2$

$2 - 2\cos 2\theta = \lambda^2$

$\lambda = 2\sin\theta$

Hence, $\hat{w} - \hat{v} = 2\sin\theta\,\hat{a}$

$= 2\cos(90 - \theta)\hat{a} = -(2\,\hat{a}.\hat{v})\hat{a}$

$\hat{w} = \hat{v} - 2(\hat{a}.\hat{v})\hat{a}$

Sol.13 (a) Let vector $\vec{r}$ be coplanar to $\vec{a}$ and $\vec{b}$

$\vec{r} = \vec{a} + t\vec{b}$

$\vec{r} = (1, 2, 1) + t(1, -1, 1)$

$\vec{r} = (1, 2, 1) + t(1, -1, 1)$

$\vec{r} = \hat{i}(1 + t)\ \hat{j}(2 - t) + \hat{k}(1 + t)$

Projection of $\vec{r}$ on $\vec{c} = \frac{1}{\sqrt{3}}$ (Given)

$t = 3$, $\vec{r} = (4, -1, 4)$

(b) Vector $\overrightarrow{AB}$ is parallel to

$[(2\hat{i}+3\hat{k})\times(4\hat{j}-3\hat{k})]\times[(\hat{j}-\hat{k})\times(3\hat{i}+3\hat{j})]$

$= 54(\hat{j} - \hat{k})$

Let θ is the angle between the vector, then

$\cos\theta = \pm\left(\frac{54+108}{(3)(54)\sqrt{2}}\right) \pm \frac{1}{\sqrt{2}}$

Hence $\theta = \frac{\pi}{4}, \frac{3\pi}{4}$

Sol.14 (a) Given vectors are coplanar

$$\begin{vmatrix} -\lambda^2 & 1 & 1 \\ 1 & -\lambda^2 & 1 \\ 1 & 1 & -\lambda^2 \end{vmatrix} = 0 \Rightarrow \lambda = \pm\sqrt{2}$$

(b) $\vec{a}, \vec{b}, \vec{c}$ are unit vectors.

$\vec{a} + \vec{b} + \vec{c} = 0$

$\Rightarrow \vec{a}, \vec{b}, \vec{c}$ represent an equilateral triangle

$\therefore \vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$

(c) **Statement-1**

$\overrightarrow{RS} + \overrightarrow{ST} = \overrightarrow{RT}$

$\therefore \overrightarrow{PQ} \times \overrightarrow{RT} \neq 0$ as they are not collinear

Statement-1 is true.

Statement-2

$\overrightarrow{PQ} \times \overrightarrow{RS} = 0$ is false as $\overrightarrow{PQ}$ and $\overrightarrow{RS}$ are not parallel.

also $\overrightarrow{PQ} \times \overrightarrow{ST} = 0$ as they are parallel.

$\therefore \overrightarrow{PQ} \times \overrightarrow{ST} \neq 0$ is false.

Statement-2 is false.

Sol.15 (a) Volume = $[\hat{a} \quad \hat{b} \quad \hat{c}]$

$$[\hat{a}\ \hat{b}\ \hat{c}]^2 = \begin{vmatrix} \hat{a}.\hat{a} & \hat{a}.\hat{b} & \hat{a}.\hat{c} \\ \hat{b}.\hat{a} & \hat{b}.\hat{b} & \hat{b}.\hat{c} \\ \hat{c}.\hat{a} & \hat{c}.\hat{b} & \hat{c}.\hat{c} \end{vmatrix} = \begin{vmatrix} 1 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & 1 & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} & 1 \end{vmatrix} = \frac{1}{2}$$

$$[\hat{a} \quad \hat{b} \quad \hat{c}] = \frac{1}{\sqrt{2}} \Rightarrow \text{Volume} = \frac{1}{\sqrt{2}}$$

(b) Given $\overrightarrow{OP} = \hat{a}\cos t + \hat{b}\sin t$

$$\overrightarrow{OP} = \sqrt{(\hat{a}.\hat{a})\cos^2 t + (\hat{b}.\hat{b})\sin^2 t + 2\hat{a}.\hat{b}\sin t\cos t}$$

$$\overrightarrow{OP} = \sqrt{1 + \hat{a}.\hat{b}\sin^2 t}$$

$$|\overrightarrow{OP}|_{max} = M = \sqrt{1 + \hat{a}.\hat{b}} \text{ at } \sin 2t = 1 \Rightarrow t = \frac{\pi}{4}$$

At $t = \frac{\pi}{4}$; $\overrightarrow{OP} = \frac{1}{\sqrt{2}}(\hat{a} + \hat{b})$

unit vector along $\overrightarrow{OP} = \vec{u} = \dfrac{\hat{a}+\hat{b}}{|\hat{a}+\hat{b}|}$

Sol.16 (a) $[(\vec{a}.\vec{c})\vec{b} - (\vec{b}.\vec{c})\vec{a}].\vec{d} = 1$

$$\left(\frac{\vec{b}.\vec{d}}{2}\right) - (\vec{b}.\vec{c})(\vec{a}.\vec{d}) = 1$$

$$\left(\frac{\vec{b}.\vec{d}}{2}\right) - 1 = 1 \Rightarrow \vec{b}\cdot\vec{d} = 4$$

$\Rightarrow \vec{b}$ & $\vec{d}$ are non-parallel

(b)

(A) $2\sin^2\theta + 4\sin^2\theta\cos^2\theta = 2$

$\sin^2\theta + 2\sin^2\theta(1 - \sin^2\theta) = 1$

$3\sin^2\theta - 2\sin^4\theta - 1 = 0$

$\Rightarrow \sin\theta = \pm\frac{1}{\sqrt{2}}, \pm 1$

$\theta = \frac{\pi}{4}, \frac{\pi}{2}$

(B) Let $y = \frac{3x}{\pi}$

$\Rightarrow \frac{1}{2} \le y \le 3 \ \forall\ x \in \left[\frac{\pi}{6}, \pi\right]$

Now $f(y) = [2y] \cos [y]$

Critical points are $y = \frac{1}{2}, y = 1, y = \frac{3}{2}, y = 3$

Points of discontinuity $\left\{\frac{\pi}{6}, \frac{\pi}{3}, \frac{\pi}{2}, \pi\right\}$

(C) Volume = $\begin{vmatrix} 1 & 1 & 0 \\ 1 & 2 & 0 \\ 1 & 1 & \pi \end{vmatrix}$

(D) $\vec{a} + \vec{b} = -\sqrt{3}\,\vec{c} \Rightarrow |\vec{a} + \vec{b}|^2 = \sqrt{3}$

$|\vec{a} + \vec{b}|^2 = 3 \Rightarrow 1 + 1 + 2\cos\theta = 3$

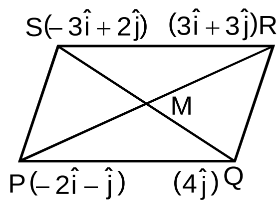
$\cos\theta = \frac{1}{2} \Rightarrow \theta = \frac{\pi}{3}$

Sol.17 Evaluating mid point of PR & QS which given M

$= \left[\frac{\hat{i}}{2} + \hat{j}\right]$, same for both

$SR = PQ = \sqrt{37}$

$PS = QR = \sqrt{10}$



angle b/w PS & SR $\neq 90^\circ$
angle b/w PR & SQ $\neq 90^\circ$
$\Rightarrow$ only parallelogram.

Sol.18 5

$2\vec{a}\cdot[(\vec{a}\times\vec{b})\times(\vec{a}-2\vec{b})] + \vec{b}\cdot[(\vec{a}\times\vec{b})\times(\vec{a}-2\vec{b})]$

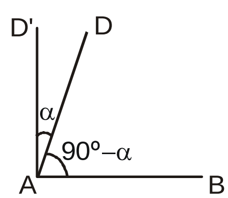
$= 2[\vec{a}\times(\vec{a}\times\vec{b}).(\vec{a}-2\vec{b})] + [\vec{b}\times(\vec{a}\times\vec{b}).(\vec{a}-2\vec{b})]$

$= -2\vec{b}.(\vec{a}-2\vec{b}) + (\vec{a}).(\vec{a}-2\vec{b}) = 4|b|^2 + |a|^2$

$(\vec{a}\cdot\vec{b} = 0)$

Sol.19 B

$$\sin(90-\alpha) = \frac{|\overrightarrow{AB}\times\overrightarrow{AD}|}{|\overrightarrow{AB}||\overrightarrow{AD}|}$$



$\cos\alpha = \frac{\sqrt{17}}{9}$

Sol.20 C

Let the vector is $\vec{v}$

$\vec{v} = x\vec{a} + y\vec{b}$

$\vec{v} = (x+y)\hat{i} + (x-y)\hat{j} + (x+y)\hat{k}$ .....(1)

proj^n of $\vec{c} = \frac{\vec{v}.\vec{c}}{|\vec{c}|} = \frac{(x+y)-(x-y)-(x+y)}{\sqrt{3}}$

$= \frac{1}{\sqrt{3}} \Rightarrow x - y = -1$ .....(2)

Sol.21 A,D

Required vector

$= [(\hat{i}+\hat{j}+2\hat{k})\times(\hat{i}+2\hat{j}+\hat{k})]\times(\hat{i}+\hat{j}+\hat{k})$

$= k(4\hat{j}+4\hat{k}) = \lambda(\hat{i}-\hat{k})$ so A & D

Sol.22

$(\vec{r}-\vec{c})\times\vec{b} = 0$

$\Rightarrow \vec{r} = \vec{c}+\lambda\vec{b} = (1-\lambda, 2+\lambda, 3)$

$\vec{r}.\vec{a} = 0 \Rightarrow \lambda = 4$ so $\vec{r}.\vec{b} = 9$

Sol.23 C

$|\vec{a}+\vec{b}| = \sqrt{29}$

$\vec{a}\times(2,3,4) - (2,3,4)\times\vec{b} = 0$

$\vec{a}\times(2,3,4) + \vec{b}\times(2,3,4) = 0$

$(\vec{a}+\vec{b})\times(2,3,4) = 0$

$\vec{a}+\vec{b} = \lambda(2,3,4)$

$|\vec{a}+\vec{b}| = \sqrt{29}$

$|\vec{a}+\vec{b}|^2 = 29$

$\lambda^2(4+9+16) = 29$

$\lambda^2 = 1 \Rightarrow \lambda = \pm 1$

$(\vec{a}+\vec{b}).(-7,2,3) = \lambda(2,3,4)\cdot(-7,2,3)$

$= \lambda[-14+6+12]$

$= \lambda[4]$

$= 4, -4$

Sol.24 Given is maximum value of expression & hence angle b/w any two is 120°

$\vec{a}.\vec{b} = \vec{b}.\vec{c} = \vec{c}.\vec{a} = \frac{-1}{2}$

so $|2\vec{a}+5\vec{b}+5\vec{c}|$ is 3