SECTION A

1. The equation of the line parallel to $\frac{x-3}{1}=\frac{y+3}{5}=\frac{2z-5}{3}$ and passing through the point (1,3,5) in vector form is………
2. The point of intersection of the lines $\vec{r}=(-\bar{i}+2\bar{j}+3\vec{k})+t(-2\bar{i}+\bar{j}+\vec{k})$ and $\vec{r}=(2\bar{i}+3\bar{j}+5\vec{k})+s(\bar{i}+2\bar{j}+3\vec{k})$ is………
3. The centre and radius of the sphere given by $x^2+y^2+z^2-6x+8y-10z+1=0$ is………
4. If $\vec{u}=\vec{a}\times(\vec{b}\times\vec{c})+\vec{b}\times(\vec{c}\times\vec{a})+\vec{c}\times(\vec{a}\times\vec{b})$,then….
5. If $\vec{a}+\vec{b}+\vec{c}=0$, $|\vec{a}|=3$, $|\vec{b}|=4$, $|\vec{c}|=5$ then the angle between $\vec{a}$ and $\vec{b}$ is
6. The vectors $2\vec{i}+3\vec{j}+4\vec{k}$ and $a\vec{i}+b\vec{j}+c\vec{k}$ are perpendicular when,…
7. The area of the parallelogram having a diagonal $3\vec{i}+\vec{j}-\vec{k}$ and a side $\vec{i}-3\vec{j}+4\vec{k}$ is ….
8. If $|\vec{a}+\vec{b}|=|\vec{a}-\vec{b}|$ then ……
9. If $\vec{p}$, $\vec{q}$ and $\vec{p}+\vec{q}$ are vectors of magnitude λ then the magnitude of $|\vec{p}-\vec{q}|$ is …….
10. If $\vec{a}\times(\vec{b}\times\vec{c})+\vec{b}\times(\vec{c}\times\vec{a})+\vec{c}\times(\vec{a}\times\vec{b})=\vec{x}\times\vec{y}$ then ………
11. If $\vec{PR}=2\vec{i}+\vec{j}+\vec{k}$, $\vec{QS}=-\vec{i}+3\vec{j}+2\vec{k}$ then the area of the quadrilateral $PQRS$ is ………
12. The projection of $\vec{OP}$ on a unit vector $\vec{OQ}$ equals thrice the area of parallelogram $OPRQ$. Then $\angle POQ$ is ……..
13. If the projection of $\vec{a}$ on $\vec{b}$ and projection of $\vec{b}$ on $\vec{a}$ are equal then the angle between $\vec{a}+\vec{b}$ and $\vec{a}-\vec{b}$ is ………
14. If $\vec{a}\times(\vec{b}\times\vec{c})=(\vec{a}\times\vec{b})\times\vec{c}$ for non-coplanar vectors $\vec{a}$, $\vec{b}$, $\vec{c}$ then ……..
15. If a line makes 45°, 60° with positive direction of axes x and y then the angle it makes with the z axis is …….
16. If $[\vec{a}\times\vec{b},\ \vec{b}\times\vec{c},\ \vec{c}\times\vec{a}]=64$ then $[\vec{a},\ \vec{b},\ \vec{c}]$ is ……….
17. If $[\vec{a}+\vec{b},\ \vec{b}+\vec{c},\ \vec{c}+\vec{a}]=8$ then $[\vec{a},\ \vec{b},\ \vec{c}]$ is ………
18. The value of $[\vec{i}+\vec{j},\ \vec{j}+\vec{k},\ \vec{k}+\vec{i}]$ is equal to …….
19. The shortest distance of the point (2, 10, 1) from the plane $\vec{r}\cdot(3\vec{i}-\vec{j}+4\vec{k})=2\sqrt{26}$ is …….
20. The vector $(\vec{a}\times\vec{b})\times(\vec{c}\times\vec{d})$ is ………
21. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are a right handed triad of mutually perpendicular vectors of magnitude a, b, c then the value of $[\vec{a}\ \vec{b}\ \vec{c}]$ is …….

22. If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar and
$\left[\vec{a}\times\vec{b},\ \vec{b}\times\vec{c},\ \vec{c}\times\vec{a}\right] = \left[\vec{a}+\vec{b},\ \vec{b}+\vec{c},\ \vec{c}+\vec{a}\right]$ then $\left[\vec{a},\ \vec{b},\ \vec{c}\right]$ is ……..

23. $\vec{r} = s\vec{i} + t\vec{j}$ is the equation of …..

24. If the magnitude of moment about the point $\vec{j} + \vec{k}$ of a force $\vec{i} + a\vec{j} - \vec{k}$ acting through the point $\vec{i} + \vec{j}$ is $\sqrt{8}$ then the value of a is…….

25. The equation of the plane passing through the point (2, 1, – 1) and the line of intersection of the planes $\vec{r}\ .\ \left(\vec{i}+3\vec{j}-\vec{k}\right) = 0$ and $\vec{r}\ .\left(\vec{j}+2\vec{k}\right) = 0$ is ……

26. The work done by the force $\vec{F} = \vec{i} + \vec{j} + \vec{k}$ acting on a particle, if the particle is displaced from $A(3, 3, 3)$ to the point $B(4, 4, 4)$ is …….

27. If $\vec{a} = \vec{i} - 2\vec{j} + 3\vec{k}$ and $\vec{b} = 3\vec{i} + \vec{j} + 2\vec{k}$ then a unit vector perpendicular to $\vec{a}$ and $\vec{b}$ is

28. The point of intersection of the lines $\frac{x-6}{-6} = \frac{y+4}{4} = \frac{z-4}{-8}$ and $\frac{x+1}{2} = \frac{y+2}{4} = \frac{z+3}{-2}$ is ….

29. The shortest distance between the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$ is …..

30. The following two lines are $\frac{x-1}{2} = \frac{y-1}{-1} = \frac{z}{1}$ and $\frac{x-2}{3} = \frac{y-1}{-5} = \frac{z-1}{2}$ …..

31. If $\vec{a}$ and $\vec{b}$ are two unit vectors and θ is the angle between them, then $\left(\vec{a}+\vec{b}\right)$ is a unit vector if …..

32. If $\vec{a}$ is a non-zero vector and m is a non-zero scalar then $m\,\vec{a}$ is a unit vector if …..

33. If $\vec{a}$ and $\vec{b}$ include an angle 120° and their magnitude are 2 and $\sqrt{3}$ then $\vec{a}\ .\ \vec{b}$ is equal to ……

34. The shortest distance between the parallel lines $\frac{x-3}{4} = \frac{y-1}{2} = \frac{z-5}{-3}$ and $\frac{x-1}{4} = \frac{y-2}{2} = \frac{z-3}{3}$ is …..

35. If $\vec{PR} = 2\vec{i} + \vec{j} + \vec{k}$, $\vec{QS} = -\vec{i} + 3\vec{j} + 2\vec{k}$ then the area of the quadrilateral $PQRS$ is ……

SECTION B

1. Altitudes of a triangle are concurrent – prove by vector method.
2. Prove that $\cos(A - B) = \cos A \cos B + \sin A \sin B$
3. Prove that $\cos(A + B) = \cos A \cos B - \sin A \sin B$
4. Prove that $\sin(A + B) = \sin A \cos B + \cos A \sin B$
5. Prove that $\sin(A - B) = \sin A \cos B - \cos A \sin B$.
6. If $\vec{a} = 2\vec{i} + 3\vec{j} - \vec{k}$, $\vec{b} = -2\vec{i} + 5\vec{k}$, $\vec{c} = \vec{j} - 3\vec{k}$
Verify that $\vec{a}\times\left(\vec{b}\times\vec{c}\right) = \left(\vec{a}\ .\ \vec{c}\right)\vec{b} - \left(\vec{a}\ .\ \vec{b}\right)\vec{c}$

7. Verify $\left(\vec{a}\times\vec{b}\right)\times\left(\vec{c}\times\vec{d}\right)=\left[\vec{a}\ \vec{b}\ \vec{d}\right]\vec{c}-\left[\vec{a}\ \vec{b}\ \vec{c}\right]\ \vec{d}$ for $\vec{a}$, $\vec{b}$, $\vec{c}$ and $\vec{d}$ in
$\vec{a}=\vec{i}+\vec{j}+\vec{k}$ $\vec{b}=2\vec{i}+\vec{k}$, $\vec{c}=2\vec{i}+\vec{j}+\vec{k}$, $\vec{d}=\vec{i}+\vec{j}+2\vec{k}$

8. Show that the lines $\frac{x-1}{3}=\frac{y-1}{-1}=\frac{z+1}{0}$ and $\frac{x-4}{2}=\frac{y}{0}=\frac{z+1}{3}$ intersect and hence find the point of intersection.

9. Show that the lines $\frac{x-1}{1}=\frac{y+1}{-1}=\frac{z}{3}$ and $\frac{x-2}{1}=\frac{y-1}{2}=\frac{-z-1}{1}$ intersect and find their point of intersection.

10. Find the vector and cartesian equations of the plane through the point $(2,-1,-3)$ and parallel to the lines $\frac{x-2}{3}=\frac{y-1}{2}=\frac{z-3}{-4}$ and $\frac{x-1}{2}=\frac{y+1}{-3}=\frac{z-2}{2}$.

11. Find the vector and cartesian equation of the plane through the point $(1,3,2)$ and parallel to the lines $\frac{x+1}{2}=\frac{y+2}{-1}=\frac{z+3}{3}$ and $\frac{x-2}{1}=\frac{y+1}{2}=\frac{z+2}{2}$

12. Find the vector and cartesian equation to the plane through the point $(-1,3,2)$ and perpendicular to the planes $x+2y+2z=5$ and $3x+y+2z=8$.

13. Find the vector and cartesian equations of the plane passing through the points $(-1,1,1)$ and $(1,-1,1)$ and perpendicular to the plane $x+2y+2z=5$

14. Find the vector and cartesian equations of the plane passing through the points $(2,2,-1)$, $(3,4,2)$ and $(7,0,6)$

15. Find the vector and cartesian equation of the plane containing the line $\frac{x-2}{2}=\frac{y-2}{3}=\frac{z-1}{3}$ and parallel to the line $\frac{x+1}{3}=\frac{y-1}{2}=\frac{z+1}{1}$.

16. Find the vector and cartesian equation of the plane passing through the points $A(1,-2,3)$ and $B(-1,2,-1)$ and is parallel to the line $\frac{x-2}{2}=\frac{y+1}{3}=\frac{z-1}{4}$

17. Find the vector and cartesian equation of the plane through the points $(1,2,3)$ and $(2,3,1)$ perpendicular to the plane $3x-2y+4z-5=0$

18. Find the vector and cartesian equation of the plane containing the line $\frac{x-2}{2}=\frac{y-2}{3}=\frac{z-1}{-2}$ and passing through the point $(-1,1,-1)$.

19. Find the vector and cartesian equation of the plane passing through the points with position vectors $3\vec{i}+4\vec{j}+2\vec{k}$, $2\vec{i}-2\vec{j}-\vec{k}$ and $7\vec{i}+\vec{k}$.

20. Derive the equation of the plane in the intercept form.

21. Find the vector and cartesian equation to the plane through the point (-1,-2,1) and perpendicular to the planes x+2y+4z+7=0 and 2x-y+3z+3=0

Curve tracing

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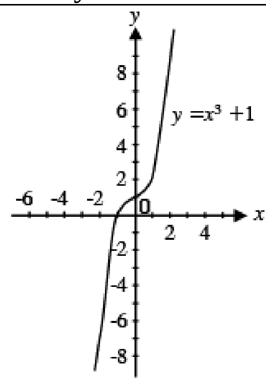
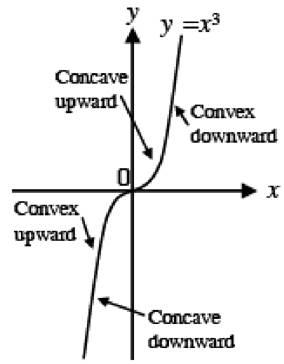
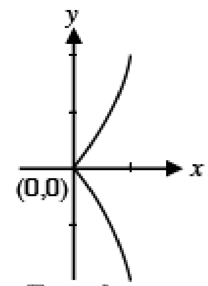
<tr><td>Figure</td><td>
</td><td>
</td><td>
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