3D_Line & Plane Level- I

your Name :

Notice:
1. For every 10 Question there are 20 minutes
2. Each question require detail answer & awarded 3 marks.
3. Each incorrect & unclear answer awarded -2 marks.

Time: Accordingly

Each question require detail answer with fig.

Test_Paper: **3D_Line** & **Plane**

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1 Find the vector equation of line which is parrellel to the vector $2\hat{\imath} - \hat{\jmath} + 3\hat{k}$ and which passes through points $(5,-2,4)$.

2 A line passes through the point with position vector $2\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$ and is in the direction of $3\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$.Find the equation of line in vector form and scalar form.

3 Find the vector equation of line passing through $(1,-2,5)$ and parrallel to the line whose eq^n are $\frac{x+5}{3} = \frac{y-1}{8} = \frac{z+3}{9}$.

4 The cartisian equation of the line is $\frac{x-1}{3} = \frac{y+5}{7} = \frac{z-1}{9}$. Find a vector equation of the line parallel to this and passing through (1,-7,-3).

5 Find the vector equation of a line passing through the point with position vector $\hat{\imath} - 2\hat{\jmath} - 3\hat{k}$ and parallel to the line joining the points $\hat{\imath} - \hat{\jmath} + 4\hat{k}$ & $2\hat{\imath} + \hat{\jmath} + 2\hat{k}$ also find cartisian equation.

6 Find the equation of line passing through (2,-1,3) and is perpendicular to the line $\vec{r} = (\hat{\imath} + \hat{\jmath} - \hat{k}) + \lambda\left(2\hat{\imath} - 2\hat{\jmath} + \hat{k}\right)$ & line $\vec{r} = (2\hat{\imath} - \hat{\jmath} - 3\hat{k}) + \mu\left(\hat{\imath} + 2\hat{\jmath} + 2\hat{k}\right)$ Also find cartisian equation.

7 Find the angle between the following pair of lines and point of intersection :

(i) $\frac{x+4}{3} = \frac{y-1}{5} = \frac{z+3}{4}$ & $\frac{x+1}{1} = \frac{y-4}{1} = \frac{z-5}{2}$

(ii) $\vec{r} = (\hat{\imath} + 2\hat{\jmath} + 3\hat{k}) + \lambda\left(2\hat{\imath} + 3\hat{\jmath} - 3\hat{k}\right)$ & $\frac{x+3}{-1} = \frac{y-5}{8} = \frac{z-1}{4}$

(iii) $\vec{r} = (\hat{\imath} + \hat{\jmath} - \hat{k}) + \lambda\left(2\hat{\imath} + \hat{\jmath} + 2\hat{k}\right)$ & $\vec{r} = (-\hat{\imath} + 3\hat{\jmath} + 5\hat{k}) + \lambda\left(\hat{\imath} + 3\hat{\jmath} + 2\hat{k}\right)$

8 (i) Show that the lines $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ & $\frac{x-2}{1} = \frac{y-4}{3} = \frac{z-6}{5}$ intersect & find the point of intersection.

(ii) Find the point of intersection. of the lines $\vec{r} = (\hat{\imath} + \hat{\jmath} - \hat{k}) + \lambda(3\hat{\imath} - \hat{\jmath})$ *and* $\vec{r} = (4\hat{\imath} - \hat{k}) + \mu\left(2\hat{\imath} + 3\hat{k}\right)$\

9 Determine whether the following pair of lines intersect or not :

(i) $\vec{r} = (\hat{\imath} - \hat{\jmath}) + \lambda\left(2\hat{\imath} + \hat{k}\right)$ & $\vec{r} = (2\hat{\imath} - \hat{\jmath}) + \mu\left(\hat{\imath} + \hat{\jmath} - \hat{k}\right)$

(ii) $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-0}{0}$ & $\frac{x+1}{5} = \frac{y-2}{1} = \frac{z-2}{0}$

10 Find the shortest distance between the following pair of lines :

11 Find the vector and cartisian equation of the plane passing through the point $\hat{\imath}+\hat{\jmath}-2\hat{k}$, $2\hat{\imath}-\hat{\jmath}+\hat{k}$ & $\hat{\imath}+2\hat{\jmath}+\hat{k}$.

12 Find the vector and cartisian equation of the plane passing through the point $(-1,-1,2)$ & perpendicular to the planes $3x+2y-3z=1$ & $5x-4y+z=5$.

13 Find the vector and cartisian equation of the plane passing through the points $(1,-1,2)$ & $(2,-2,2)$ and which is perpendicular to the plane $6x-2y+2z=9$

14 If the planes $\vec{r}.(2\hat{\imath}-\hat{\jmath}+\lambda\hat{k})=5$ & $\vec{r}.(3\hat{\imath}+2\hat{\jmath}+2\hat{k})=4$ are perpendicular ,then find the value of λ.

15 Find the vector and cartisian equation of the plane which is at a distance of 3 units from the origin & has $\hat{k}$ as the unit normal to it.

16 Find the vector and cartisian equation of the plane passing through the point (1,2,1) and perpendicular to the line joining the points (1,4,2) & (2,3,5). Find perpendicular distance of this plane from origin.

17 Write the normal form of the equation of the plane $2x-3y+6z-14=0$ & also find its vector form.

18 Find the equation of a plane which is at a distance $3\sqrt{3}$ units from the origin and the normal to which is equally inclined with the co-ordinates axes.

19 Find the angle between the planes :

(i) $\vec{r}.(2\hat{\imath}-3\hat{\jmath}+4\hat{k})=1$ & $\vec{r}.(-\hat{\imath}+\hat{\jmath})=4$

(ii) $\vec{r}.(2\hat{\imath}-\hat{\jmath}+2\hat{k})=6$ & $\vec{r}.(3\hat{\imath}+6\hat{\jmath}-2\hat{k})=9$

(iii) $2x-y+z=4$ & $x+y+2z=3$

(iv) $x+y-2z=3$ & $2x-2y+z=5$

20 Show that the following planes are right angle :

(i) $\vec{r}.(2\hat{\imath}-\hat{\jmath}+\hat{k})=5$ & $\vec{r}.(-\hat{\imath}-\hat{\jmath}+\hat{k})=3$

(ii) $x-2y+4z=10$ & $18x+17y+4z=49$

21 Find the vector and cartisian equation of the plane passing through the point $\hat{\imath}-\hat{\jmath}-3\hat{k}$, $2\hat{\imath}+3\hat{\jmath}-4\hat{k}$ & $\hat{\imath}+2\hat{\jmath}-2\hat{k}$.

22 Find the vector and cartisian equation of the plane passing through the point $(-3,-2,4)$ & perpendicular to the planes $3x+2y-3z=1$ & $5x-4y+z=5$.

23 Find the vector and cartisian equation of the plane passing through the points $(1,-1,2)$ & $(3,-4,5)$ and which is perpendicular to the plane $3x-2y+4z=9$

24 If the planes $\vec{r}.(2\hat{\imath}-2\hat{\jmath}+3\hat{k})=5$ & $\vec{r}.(3\hat{\imath}+\lambda\hat{\jmath}+2\hat{k})=4$ are perpendicular ,then find the value of λ.

25 Find the vector and cartisian equation of the plane which is at a distance of 8 units from the origin & has $\hat{\jmath}$ as the unit normal to it.

26 Find the vector and cartisian equation of the plane passing through the point $(-1,3,1)$ and perpendicular to the line joining the points $(-2,3,4)$ & $(2,-3,1)$. Find perpendicular distance of this plane from origin.

27 Write the normal form of the equation of the plane $2x+3y+6z-7=0$ & also find its vector form.

28 Find the equation of a plane which is at a distance $2\sqrt{3}$ units from the origin and the normal to which is equally inclined with the co-ordinates axes.

Find the angle between the planes :

29 (i) $\vec{r}.(2\hat{i}-\hat{j}+4\hat{k}) = 1$ & $\vec{r}.(\hat{i}+3\hat{j}-4\hat{k}) = 4$ (ii) $\vec{r}.(2\hat{i}+6\hat{j}-3\hat{k}) = 6$ & $\vec{r}.(5\hat{i}-3\hat{j}-8\hat{k}) = 9$ (iii) $2x-y+3z = 1$ & $x+y-3z = 12$ (iv) $x+y-2z = 3$ & $3x-2y+2z = 5$

Show that the following planes are right angle : (i) $\vec{r}.(2\hat{i}-\hat{j}+\hat{k}) = 5$ & $\vec{r}.(-\hat{i}-\hat{j}+\hat{k}) = 3$ (ii) $x-2y+4z = 10$ & $18x+17y+4z = 49$