





MATHS

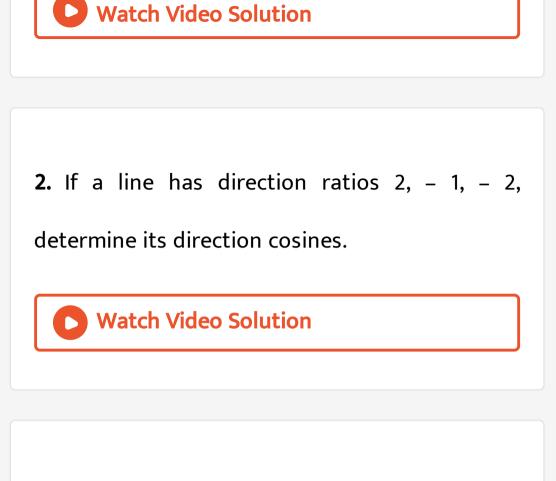
BOOKS - PSEB

THREE DIMENSIONAL GEOMETRY



1. If a line makes angle 90° , 60° , 30° with the positive direction of x, y and z-axis respectively, find its direction cosines.





3. The direction cosines of the line joining the

points (-2, 4, -5) and (1, 2, 3) is :

4. Find the direction cosines of x, y and z-axis.



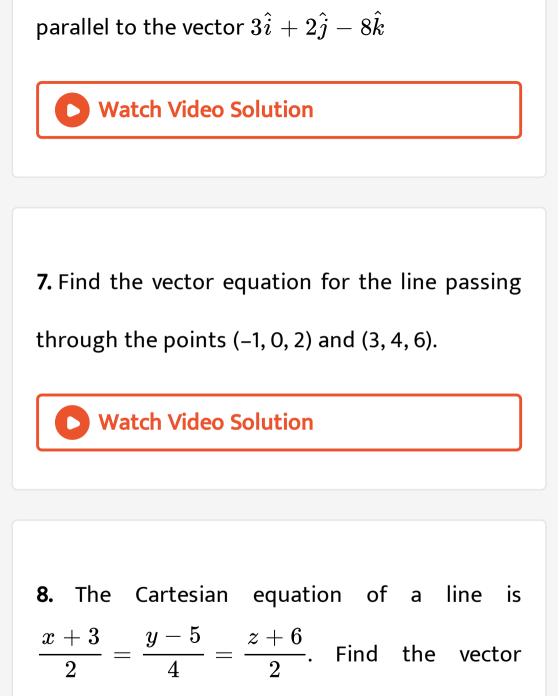
5. Show that the points A(2, 3, -4), B(1, -2, 3), C(3, 8, -11) are

collinear.



6. Find the vector and the Cartesian equations of

the line through the point (5, 2, – 4) and which is



equation for the line.

9. Find the angle between the pair of lines given
by
$$\overrightarrow{r} = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda(\hat{i} + 2\hat{j} + 2\hat{k})$$
 and
 $\overrightarrow{r} = 5\hat{i} - 2\hat{j} + \mu(3\hat{i} + 2\hat{j} + 6\hat{k})$

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10. Find the angle between the pair of lines

$$rac{x+3}{3} = rac{y-1}{5} = rac{z+3}{4}$$
and $rac{x+1}{1} = rac{y-4}{1} = rac{z-5}{2}$

11. 1 Find the shortest distance between the lines l_1 and l_2 whose vector equations are: $\overrightarrow{r} = \hat{i} + \hat{j} + \lambda \left(2\hat{i} - \hat{j} + \hat{k}\right)$, and $\overrightarrow{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu \left(3\hat{i} - 5\hat{j} + 2\hat{k}\right)$

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12. Find the distance between the lines l_1 and l_2

given by : $ec{r}=\hat{i}+2\hat{j}-4\hat{k}+\lambda\Big(2\hat{i}+3\hat{j}+6\hat{k}\Big)$ and $ec{r}=3\hat{i}+3\hat{j}-5\hat{k}+\mu\Big(2\hat{i}+3\hat{j}+6\hat{k}\Big)C\widetilde{O}$



13. Find the vector equation of the plane which is at a distance of $\frac{6}{\sqrt{29}}$ from the origin and its normal vector from the origin is $2\hat{i} - 3\hat{j} + 4\hat{k}$. Also find its cartesian form.

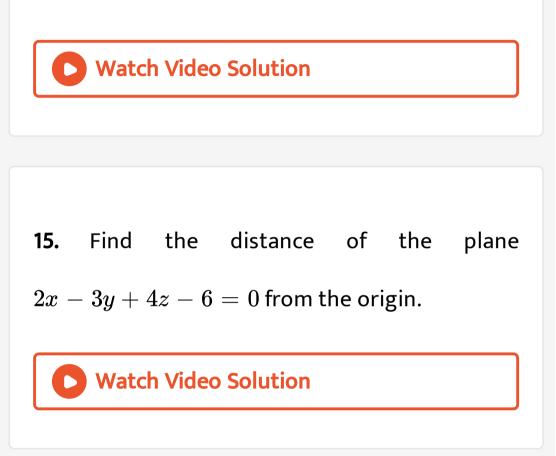
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14. Find the direction cosines of the unit vector

perpendicular to the plane

$$\overrightarrow{r}\cdot\left(6\hat{i}-3\hat{j}-2\hat{k}
ight)+1=0$$
 passing through

the origin.



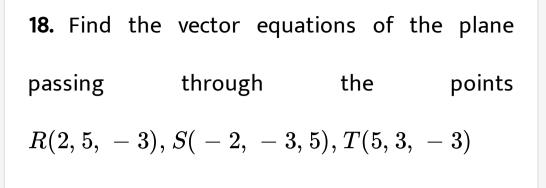
16. Find the coordinates of the foot of the perpendicular drawn from the origin to the

plane 2x - 3y + 4z - 6 = 0



17. Find the vector and cartesian equations of the plane which passes through the point (5, 2, –
4) and perpendicular to the line with direction ratios 2, 3, – 1.







19. Find the equation of the plane with intercepts 2, 3 and 4 on the x, y and z-axis respectively.



20. Find the vector equation of the plane passing through the intersection of the planes $\overrightarrow{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 6$ and $\overrightarrow{r} \cdot (2\hat{i} + 3\hat{j} + 4\hat{k}) = -5$, and the point (1, 1, 1).



21. Show that the lines
$$\frac{x+3}{-3} = \frac{y-1}{1} = \frac{z-5}{5}$$
 and
$$\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$$
 are coplanar.

22. Find the angle between the two planes 2x + y - 2z = 5 and 3x - 6y - 2z = 7 using vector method.

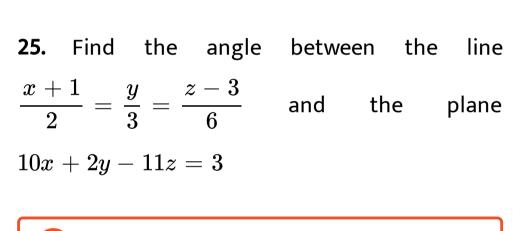
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23. Find the angle between the two planes

3x-6y+2z=7 and 2x+2y-2z=5

24. Find the distance of a point (2, 5, – 3) from the plane $\overrightarrow{r}\cdot\left(6\hat{i}-3\hat{j}+2\hat{k}
ight)=4$

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26. If a line marks angles α , β and γ with the coordinates axes, prove that $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = 2.$

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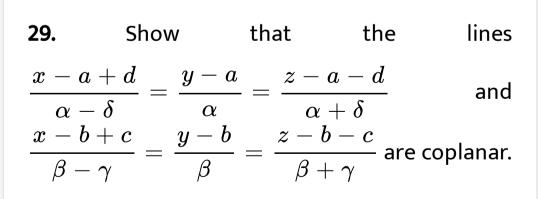
27. Find the equation of the plane passing through the point (1, -1, 2) and perpendicular to

the planes 2x + 3y - 2z = 5 and x + 2y - 3z = 8.

28. Find the distance between the point P(6, 5, 9) and the plane determined by the points

A(3, -1, 2), B(5, 2, 4), C(-1, -1, 6)

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30. Find the coordinates of the point where the line through the points A(3, 4, 1) and B(5, 1, 6) crosses the XY-plane.





1. A line makes $90^\circ,\,135^\circ,\,45^\circ$ with x, y and z

axes respectively than its direction cosines are

2. Find the direction cosines of a line which makes equal angles with the coordinate axes.
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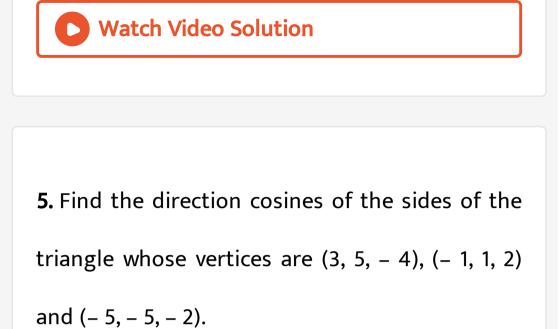
3. If a line has the direction ratios -18, 12, - 4,

then what are its direction cosines ?

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4. Show that the points (2, 3, 4), (-1, -2, 1), (5, 8,

7) are collinear.



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6. Show that the three lines with direction cosines $\frac{12}{13}, -\frac{3}{13}, -\frac{4}{13}, \frac{4}{13}, \frac{12}{13}, \frac{3}{13}, \frac{3}{13}, -\frac{4}{13}, \frac{12}{13}$

are mutually perpendicular.



7. Show that the line through the points (1, - 1,

2), (3, 4, – 2) is perpendicular to the line through

the points (0, 3, 2) and (3, 5, 6).



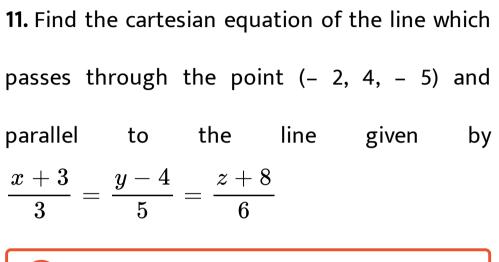
- 8. Show that the line through the points (4, 7, 8),
- (2, 3, 4) is parallel to the line through the points
- (-1, -2, 1), (1, 2, 5).

9. Find the equation of the line which passes through the point (1, 2, 3) and is parallel to the vector $3\hat{i} + 2\hat{j} - 2\hat{k}$

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10. Find the equation of the line in vector and in cartesian form that passes through the point with position vector $2\hat{i} - \hat{j} + 4\hat{k}$ and is in the direction $\hat{i} + 2\hat{j} - \hat{k}$





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12. The cartesian equation of a line is
$$\frac{x-5}{3} = \frac{y+4}{7} = \frac{z-6}{2}$$
. Write its vector

form.



13. Find the vector and the cartesian equations of the lines that passes through the origin and (5, – 2, 3).

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14. Find the vector and the cartesian equations of the line that passes through the points (3, – 2,

– 5), (3, – 2, 6).



15. Find the angle between the following pair of

lines: $\overrightarrow{r}=2\hat{i}-5\hat{j}+\hat{k}+\lambda\Big(3\hat{i}+2\hat{j}+6\hat{k}\Big)$ and $\overrightarrow{r}=7\hat{i}-6\hat{j}+\mu\Big(\hat{i}+2\hat{j}+2\hat{k}\Big)$

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16. Find the angle between the following pair of

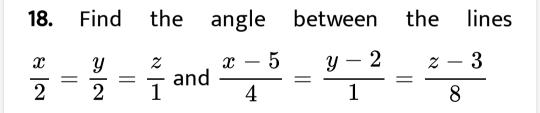
lines:
$$\overrightarrow{r}=3\hat{i}+\hat{j}-2\hat{k}+\lambda\Big(\hat{i}-\hat{j}-2\hat{k}\Big)$$
 and $\overrightarrow{r}=2\hat{i}-\hat{j}-56\hat{k}+\mu\Big(3\hat{i}-5\hat{j}-4\hat{k}\Big)$

17. Find the angle between the lines

$$\frac{x-2}{2} = \frac{y-1}{5} = \frac{z+3}{-3}$$
and

$$\frac{x+2}{-1} = \frac{y-4}{8} = \frac{z-5}{4}$$





19. Find the values of p so that the lines

$$\frac{1-x}{3} = \frac{7y-14}{2}p = \frac{z-3}{2}$$
 and

$$\frac{7-7x}{3}p = \frac{y-5}{1} = \frac{6-z}{5}$$
 are at right

angles.

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20. Show that the lines
$$\frac{x-5}{7} = \frac{y+2}{-5} = \frac{z}{1}$$

and $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ are perpendicular to each other

21. Find the shortest distance between the lines

$$ec{r} = ig(\hat{i} + 2\hat{j} + \hat{k} ig) + \lambda ig(\hat{i} - \hat{j} + \hat{k} ig) \qquad ext{ and } \ ec{r} = 2\hat{i} - \hat{j} - \hat{k} + \mu ig(2\hat{i} + \hat{j} + 2\hat{k} ig)$$



22. Find the shortest distance between the lines

$$rac{x+1}{7} = rac{y+1}{-6} = rac{z+1}{1}$$
 and $rac{x-3}{1} = rac{y-5}{-2} = rac{z-7}{1}$

23. Find the shortest distance between the lines

whose vector equations are
$$ec{r}=\left(\hat{i}+2\hat{j}+3\hat{k}
ight)+\lambda\left(\hat{i}-3\hat{j}+2\hat{k}
ight)$$
 and $ec{r}=4\hat{i}+5\hat{j}+6\hat{k}+\mu\left(2\hat{i}+3\hat{j}+\hat{k}
ight)$

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24. Find the shortest distance between the lines

whose vector equations are
$$ec{r}=(1-t)\hat{i}+(t-2)\hat{j}+(3-2t)\hat{k}$$
 and $ec{r}=(s+1)\hat{i}+(2s-1)\hat{j}-(2s+1)\hat{k}$

25. In the following case, determine the direction cosines of the normal to the plane and the distance from the origin: z=2

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26. In the following case, determine the direction cosines of the normal to the plane and the distance from the origin: x+y+z=1

27. In the following case, determine the direction cosines of the normal to the plane and the distance from the origin: 2x + 3y - z = 5



28. In the following case, determine the direction cosines of the normal to the plane and the distance from the origin: 5y + 8 = 0

29. Find the vector equation of a plane which is at a distance of 7 units from the origin and normal to the vector $3\hat{i} + 5\hat{j} - 6\hat{k}$.

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30. Find the Cartesian equation of the following

plane:
$$\overrightarrow{r} \cdot \left(\hat{i} + \hat{j} - \hat{k}
ight) = 2$$

31. Find the Cartesian equation of the following

plane:
$$\overrightarrow{r} \cdot \left(2\hat{i}+3\hat{j}-4\hat{k}
ight)=1$$

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32. Find the Cartesian equation of the following plane:

$$\overrightarrow{r}\cdot\left[(s-2t)\hat{i}+(3-t)\hat{j}+(2s+t)\hat{k}
ight]=15$$

33. In the following case, find the coordinates of the foot of the perpendicular drawn from the origin: 2x + 3y + 4z - 12 = 0



34. In the following case, find the coordinates of

the foot of the perpendicular drawn from the

origin: 3y + 4z - 6 = 0

35. In the following case, find the coordinates of the foot of the perpendicular drawn from the origin: x + y + z = 1

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36. In the following case, find the coordinates of the foot of the perpendicular drawn from the origin: 5y + 8 = 0

37. Find the vector and cartesian equations of the plane that passes through the point (1, 0, – 2) and the normal to the plane is $\hat{i} + \hat{j} - \hat{k}$



38. Find the vector and cartesian equations of the plane that passes through the point (1,4, 6) and the normal vector to the plane is $\hat{i} - 2\hat{j} + \hat{k}$

39. Find the equations of the plane that passes

through three points : (1,1,-1), (6,4,-5), (-4,-2,3)

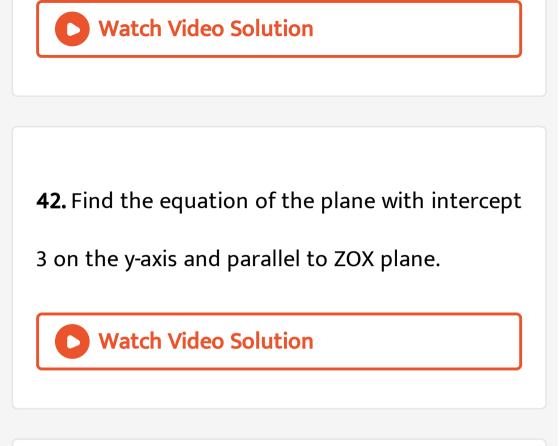


40. Find the equations of the plane that passes

through three points : (1,1,0), (1,2,1), (-2,2,-1)



41. Find the intercepts cut off by the plane 2x + y - z = 5



43. Find the equation of the plane through the intersection of the planes 3x - y + 2z - 4 = 0 and x + y + z - 2 = 0 and the point (2, 2, 1).

44. Find the vector equation of the plane passing through the intersection of the planes $\vec{r} \cdot \left(2\hat{i} + 2\hat{j} - 3\hat{k}\right) = 7, \ \vec{r} \cdot \left(2\hat{i} + 5\hat{j} + 3\hat{k}\right) = 9$

and through the point (2, 1, 3)



45. Find the equation of the plane through the line of intersection of the planes given by the equations x + y + z = 1 and 2x + 3y + 4z = 5 which is perpendicular to the plane given by the equation x - y + z = 0.

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46. Find the angle between the planes whose vector equations are
$$\overrightarrow{r} \cdot \left(2\hat{i} + 2\hat{j} - 3\hat{k}\right) = 5$$
 and $\overrightarrow{r} \cdot \left(3\hat{i} - 3\hat{j} + 5\hat{k}\right) = 3$

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47. In the following case, determine whether the given planes are parallel or perpendicular, and in case they are neither, find the angles between

them: 7x + 5y + 6z + 30 = 0 and

$$3x - y - 10z + 4 = 0$$

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48. In the following case, determine whether the given planes are parallel or perpendicular, and in case they are neither, find the angles between them: 2x + y + 3z - 2 = 0 and

x - 2y + 5 = 0

49. In the following case, determine whether the given planes are parallel or perpendicular, and in case they are neither, find the angles between them: 2x - 2y + 4z + 5 = 0 and 3x - 3y + 6z - 1 = 0

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50. Unit the following case, determine whether the given planes are parallel or perpendicular, and in case they are neither, find the angles between them: 2x - y + 3z - 1 = 0 and 2x - y + 3z + 3 = 0



51. In the following case, determine whether the given planes are parallel or perpendicular, and in case they are neither, find the angles between them: 4x + 8y + z - 8 = 0 and y + z - 4 = 0

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52. In the following case, find the distance of each of the given point from the corresponding

given plane: Point (0,0,0) Plane

$$3x - 4y + 12z = 3$$

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53. In the following case, find the distance of each of the given point from the corresponding given plane: Point (3,-2,1) Plane 2x - y + 2z + 3 = 0

54. In the following case, find the distance of each of the given point from the corresponding given plane:Point (2,3,-5) Plane x + 2y - 2z = 9



55. In the following case, find the distance of each of the given point from the corresponding given plane: Point (-6,0,0) Plane 2x - 3y + 6z - 2 = 0

56. Show that the line joining the origin to the point (2, 1, 1) is perpendicular to the line determined by the points (3, 5, -1), (4, 3, -1).



57. If l_1 , m_1 , n_1 and l_2 , m_2 , n_2 are the direction cosines of two mutually perpendicular lines, show that the direction cosines of the line perpendicular to both of these are $m_1n_2 - m_2n_1$, $n_1l_2 - n_2l_1$, $l_1m_2 - l_2 - m_1$

58. Find the angle between the lines whose direction ratios are a, b, c and b-c, c-a, a-b



59. Find the equation of a line parallel to x-axis

and passing through the origin.

60. If the coordinates of the points A, B, C, D be (1, 2, 3), (4, 5, 7), (– 4, 3, – 6) and (2, 9, 2) respectively, then find the angle between the lines AB and CD.



61. If the lines
$$\frac{x-1}{-3} = \frac{y-2}{2}k = \frac{z-3}{2}$$
 and $\frac{x-1}{3}k = \frac{y-1}{1} = \frac{z-6}{-5}$ are perpendicular,

find the value of k

62. Find the vector equation of the line passing through (1, 2, 3) and perpendicular to the plane $\overrightarrow{r}\cdot\left(\hat{i}+2\hat{j}-5\hat{k}
ight)+9=0$

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63. Find the equation of the plane passing through (a, b, c) and parallel to the plane $\overrightarrow{r}\cdot\left(\hat{i}+\hat{j}+\hat{k}
ight)=2$

64. Find the shortest distance between the lines

given by the line :
$$ec{r}=6\hat{i}+2\hat{j}+2\hat{k}+\lambda\Big(\hat{i}-2\hat{j}+2\hat{k}\Big)$$
and $ec{r}=4\hat{i}+\hat{k}+\mu\Big(3\hat{i}-2\hat{j}-2\hat{k}\Big)$.

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65. Find the coordinates of that point when the

line passing through two points (5, 1, 6) and (3,

4, 1) crosses YZ plane.



66. Find the coordinates of the point where the

line through (3, -4, -5) and (2, -3, 1) crosses

the plane 2x + y + z = 7



67. Find the equation of the plane passing through the point (-1, 3, 2) and perpendicular to each of the planes : x + 2y + 3z = 5 and 3x + 3y + z = 0.

68. If the points (1, 1, p) and (- 3, 0, 1) be equidistant from the plane $\vec{r} \cdot \left(3\hat{i} + 4\hat{j} - 12\hat{k}\right) + 13 = 0$ then find the value of p.

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69. Find the equation of the plane passing through the line of intersection of the planes $\overrightarrow{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 1$ and $\overrightarrow{r} \cdot (2\hat{i} + 3\hat{j} - \hat{k}) + 4 = 0$ and parallel to x-

axis.



70. If O be the origin and the coordinates of P be

(1, 2, -3), then find the equation of the plane

passing through P and perpendicular to OP.

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71. Find the equation of the plane which contains the line of intersection of the planes $\overrightarrow{r} \cdot (\hat{i} + 2\hat{j} + 3\hat{k}) - 4 = 0$ and $\overrightarrow{r} \cdot (2\hat{i} + \hat{j} - \hat{k}) + 5 = 0$ and which is perpendicular

$$\overrightarrow{r}\cdot\left(5\hat{i}+3\hat{j}-6\hat{k}
ight)+8=0$$

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72. Find the distance of the point (-1 , -5 , -10) from the point of intersection of the line $\vec{r} = 2\hat{i} - \hat{j} + 2\hat{k} + \lambda \left(3\hat{i} + 4\hat{j} + 2\hat{k}\right)$ and the plane $\vec{r} \cdot \left(\hat{i} - \hat{j} + \hat{k}\right)$ =5.

73. Find the vector equation of the line passing through (1, 2, 3) and parallel to the planes \overrightarrow{r} . $(\hat{i} - \hat{j} + 2\hat{k}) = 5$ and \overrightarrow{r} . $(3\hat{i} + \hat{j} + \hat{k}) = 6$.

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74. Find the equations of the straight line passing through the point (1, 2, - 4) and is perpendicular to the lines : $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}.$

75. Prove that if a plane has the intercepts a, b, c and is at a distance of p units from the origin, then $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} = \frac{1}{p^2}$ Watch Video Solution

76. Distance between the two planes: 2x + 3y + 4z = 4 and 4x + 6y + 8z = 12 is:

A. 2 units

B. 4 units

C. 8 units

D.
$$rac{2}{\sqrt{29}} units$$

Answer:



77. The planes 2x - y + 4z = 5 and

$$5x - 2.5y + 10z = 6$$
 are :

A. Perpendicular

B. Parallel

C. ntersect y-axis

D. passes through
$$\left(0,\,0,\,rac{5}{4}
ight)$$

Answer:

