MATHS

BOOKS - OSWAAL PUBLICATION MATHS (KANNADA ENGLISH)

THREE DIMENSIONAL GEOMETRY

Topic 1 Very Short Answer Type Questions

1. Write the direction consines of y-axis.

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2. If a line makes angle $90^\circ, 60^\circ$ and 30° with the positive direction of x,y and z-aixs respectively, find its direction cosines.

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3. Write the distance of a point $P(a, b, c)$ from x-axis.

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4. If a line makes angles $90o$, $135o$, $45o$ with the x, y and z-axes respectively, find its direction cosines.

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5. Find the angle between x-axis and the vector $\hat{i} + \hat{j} + \hat{k}$

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6. If a line has direction ratios 2,-1,-2 then determine its direction cosines.

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7. Write the direction-cosines of the line joining the points (1, 0, 0) and (0, 1, 1).

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8. Find the direction cosines of a line, passing through origin and lying in the first octant, making equal angles with the three coordinate axes.

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Topic 1 Short Answer Answer Type Questions I

1. Find the angle between the pair of lines

$\vec{r} = 3\hat{i} + 5\hat{j} - \hat{k} + \lambda\left(\hat{i} + \hat{j} + \hat{k}\right)$ and $\vec{r} = 7\hat{i} + 4\hat{k} + \mu\left(2\hat{i} + 2\hat{j} + 2\hat{k}\right)$

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2. Find the direction cosines of the line passing through the points P(2,3,5) and Q(-1,2,4)

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Topic 2 Short Answer Type Questions I

1. Find the angle between the following pairs of lines :

$\vec{r} = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$ & $\vec{r} = 5\hat{i} - 2\hat{j} + \mu\left(3\hat{i} + 2\hat{j} + 6\hat{k}\right)$

Note : Angle between two lines is the angle between $\vec{b_1}$ and $\vec{b_2}$

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2. The Cartesian equations of a line are $\frac{3-x}{5} = \frac{y+4}{7} = \frac{2z-6}{4}$.

Write the vector equations of the line .

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3. Find the direction cosines of the line $\frac{4-x}{2}=\frac{y}{6}=\frac{1-z}{3}$

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4. Write the vector equation of a line passing through the point (1,-2,2) and parallel to the line whose equations are $\frac{x-3}{1}=\frac{y-1}{2}=\frac{z+1}{-2}$

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5. If a equations of a line are `(3-x)/(-3) =(y+2)/(-2) =(z+2)/(6) , Find the direction cosines of a line parallel to the given line.

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6. The equation of a line given by $\frac{4-x}{3}=\frac{y+3}{3}=\frac{z+2}{6}$. Write the direction cosines of a line parallel to this line.

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Topic 2 Short Answer Type Questions Ii

1. the line passing through the points $(3, -2- -5)$, and $(3, -2, 6)$

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2. 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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3. Find the distance between the parallel lines $\vec{r}=\hat{i}+2\hat{j}-4\hat{k}+m\left(2\hat{i}+3\hat{j}+6\hat{k}\right)$ and $\vec{r}=3\hat{i}+3\hat{j}-5\hat{k}+n\left(2\hat{i}+$

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4. Find the shortest distance between the lines L_1 and L_2 given by $\vec{r}=\hat{i}+\hat{j}+\lambda\left(2\hat{i}-\hat{j}+\hat{k}\right)$ and $\vec{r}=2\hat{i}+\hat{j}-\hat{k}+\mu\left(4\hat{i}-2\hat{j}+2\hat{k}\right)$

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5. Find the coordinates of the foot of perpendicular drawn from th point $A(1, 8, 4)$ to the line joining the points $B(0, -1, 3) and C(2-3, -1)$.

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6. 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 $\vec{r}\,\hat{i} - \dot{\hat{j}} + \hat{k} = 5$.

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7. Find the direction cosines of the line $\frac{x+2}{2} = \frac{2y-7}{6} = \frac{5-z}{6}$. Also, find the vector equation of the line through the point $A(-1, 2, 3)$ and parallel to the given line.

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8. Find the shortest distance between two lines whose vector equations are

$\vec{r} = \left(\hat{i} + 2\hat{j} + 3\hat{k}\right) + \lambda\left(\hat{i} - 3\hat{j} + 2\hat{k}\right)$ and $\vec{r} = \left(4\hat{i} + 5\hat{j} + 6\hat{k}\right) + \mu\left(2\hat{i}$

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9. Show that the lines $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ and $\frac{x-2}{1} = \frac{y-4}{3} = \frac{z-6}{5}$ intersect. Also find their point of intersection.

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10. Show that the lines $\frac{5-x}{-4} = \frac{y-7}{4} = \frac{z+3}{-5}$ and $\frac{x-8}{7} = \frac{2y-8}{2} = \frac{z-5}{3}$ are coplanar. Also find the lines $\frac{5-x}{-4} = \frac{y-7}{4} = \frac{z+3}{-5}$ and $\frac{x-8}{7} = \frac{2y-8}{2} = \frac{z-5}{3}$ are coplanar. Find the equation of the plane containing these lines.

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11. Show that the lines $\vec{r} = \vec{i} + \vec{j} - \vec{k} + \lambda\left(3\vec{i} - \vec{j}\right)$ and $\vec{r} = 4\vec{i} - \vec{k} + \mu\left(2\vec{i} + 3\vec{k}\right)$ intersect. Also find their point of intersection.

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12. The equation of line passing through $(3, -1, 2)$ and perpendicular to the lines

$\vec{r} = \left(\hat{i} + \hat{j} - \hat{k}\right) + \lambda\left(2\hat{i} - 2\hat{j} + \hat{k}\right)$ and $\vec{r} = \left(2\hat{i} + \hat{j} - 3\hat{k}\right) + \mu\left(\hat{i} - 2\right.$

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13. Find the equation of the line passing through the point (2, 1, 3) and perpendicular to the lines $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3} an \frac{dx}{-3} = \frac{y}{2} = \frac{z}{5}$

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14. Find the values of p so that the lines $\frac{1-x}{3}=\frac{7y-14}{2p}=\frac{z-3}{2}$ and $\frac{7-7x}{3p}=\frac{y-5}{1}=\frac{6-z}{5}$ are at right angles.

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15. Find the shortest distance between the lines whose vector equations are

$\vec{r}=\left(\hat{i}+\hat{j}\right)+\lambda\left(2\hat{i}-\hat{j}+\hat{k}\right)$ and $\vec{r}=\left(2\hat{i}+\hat{j}-\hat{k}\right)+\mu\left(3\hat{i}-5\hat{j}+2\right.$

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16. Find the equation of the perpendicular drawn from the point $(2,4,-1)$ to the line $x+5=\frac{1}{4}(y+3)=-\frac{1}{9}(z-6)$ and obtain the co-ordinates of the foot of this perpendicular

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17. Using vectors show that the points $A(-2, 3, 5), B(7, 0, -1) C(-3, -2, -5)$ and $D(3, 4, 7)$ are such that AB and CD intersect at the point $P(1, 2, 3)$.

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18. Show that the lines

$$\vec{r} = \left(\hat{i} - \hat{j}\right) + \lambda\left(2\hat{i} + \hat{k}\right) \quad \text{and} \quad \vec{r} = \left(2\hat{i} - \hat{j}\right) + \mu\left(\hat{i} + \hat{j} - \hat{k}\right)$$

do not intersect .

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

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20. Find the shortest distance between the following pair of lines :

$$\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}, \frac{x-2}{3}=\frac{y-3}{4}=\frac{z-5}{5}$$

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21. 2/ Find the perpendicular distance of the point (1, 0, 0) from the line $\frac{x-1}{2}=\frac{y+1}{-3}=\frac{z+10}{8}$Also, and the coordinates of the foot of the perpendicular and the equation of the perpendicular.

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22. Find the shortest distance between the following lines whose vector equations are: $\vec{r}=(1-t)\hat{i}+(t-2)\hat{j}+(3-2t)\hat{k}$ and $\vec{r}=(s+1)\hat{i}+(2s-1)\hat{j}-(2s+1)\hat{k}$.

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23. Find the angle between the following pair of lines: $\frac{-x+2}{-2}=\frac{y-1}{7}=\frac{z+3}{-3}$ and $\frac{x+2}{-1}=\frac{2y-8}{4}=\frac{z-5}{4}$ and check whether the lines are parallel or perpendicular.

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Topic 2 Long Answer Type Questions Ii

1. Derive the equation of a line in space passing through a given pont and parallel to a given vector in both vector and Cartesian form.

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2. Derive the condition for the coplanarity of two lines in space both in vector and cartesian form.

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3. Find the coordinates of the foot of the $\perp$ and the length of the $\perp$ drawn from the point P(5,4,2) to the line. $\vec{r} = -\hat{i} + 3\hat{j} + \hat{k} + \lambda\left(2\hat{i} + 3\hat{j} - \hat{k}\right)$. Also find the image of P in this line.

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4. Find the equation of line passing through points $A(0, 6, -9)$ and $B(-3, -6, 3)$. If D is the foot of perpendicular drawn from the point $C(7, 4, -1)$ on the line AB, then find the coordinates of point D and equation of line CD.

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5. Find the image of the point $(1, 6, 3)$ in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$. Also, write the equation of the line joining the given point and its image and find length of the segment joining the given point and its image.

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6. The points A(4, 5, 10), B(2, 3, 4) and C (1, 2,-1) are three vertices of a parallelogram ABCD. Find the vector equations of the sides AB and BC and also find the coordinates of point D.

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7. Write the vector equations of the following lines and hence determine the distance between them $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z+4}{6} and \frac{x-3}{4}=\frac{y-3}{6}=\frac{z+5}{12}$

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Topic 3 Very Short Answer Type Questions

1. Find the equation of the plane with intercept 3 on the y-axis and parallel to ZOX plane.

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2. Find the equation of the plane which makes intercepts 1,-1 and 2 on the x,y and z axes respectively.

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3. Find the distance of the plane $2x - 2y + 4z = 6$ from the origin.

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4. Find the equation of plane with intercept 4 on z axis and parallel to XY plane.

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5. Write the distance of a point $P(a, b, c)$ from x-axis.

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6. Write the vector equation of the plane, passing through the point (a,b,c) and parallel to the plane $\vec{r}\,\hat{i} + \dot{\hat{j}} + \hat{k} = 2$.

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7. Find the length of the perpendicular drawn from the origin to the plane 2x $3y + 6z + 21 = 0$.

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8. Write the distance between the parallel planes 2x - y + 3x = 4 and 2x - y + 3z = 18 .

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9. Find the distance of the plane $3x\ \ 4y + 12z = 3$ from the origin.

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10. Write the intercept cut off by the plane $2x + y - z = 5$ on $x - a\xi s$.

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11. Find the value of λ , such that the line $\frac{x-2}{6} = \frac{y-1}{\lambda} = \frac{z+5}{-4}$ is perpendicular to the plane 3x - y - 2z = 7 .

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12. Find the distance of the point (2,3,4) from the x-axis.

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13. Write the distance of the following plane from the origin:

$2x - y + 2z + 1 = 0$

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Topic 3 Short Answer Type Questions I

1. Find the distance of the point (2,3,-5) from the plane $r.(i+2j-2k)=9.$

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2. The equation of the plane passing through the line of intersection of the planes $x+y+z=6$ and $2x+3y+4z+5=0$ and perpendicular to the plane $4x+5y-3z=8$ is

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

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Topic 3 Short Answer Type Questions Ii

1. Find the distance of a point (2,5,-3) from the plane . $\vec{r}\left(6\hat{i}-3\hat{j}+2\hat{k}\right)$ = 4

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2. Find the equation of the plane passing through the intersection of the planes

3x + 2y - z + 1 = 0 and x + y + z - 2 = 0 and the point (2, 2, 1).

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3. 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 $\vec{r}\,\hat{i} - \hat{j} + \hat{k} = 5$.

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4. Find the image of the point having position vector $\hat{i} + 2\hat{j} + 4\hat{k}$ in the plane $\vec{r}\,2\hat{i} - \hat{j} + \hat{k} + 3 = 0$.

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5. Find the coordinates of the point, where the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{2}$ intersects the plane $x - y + z - 5 = 0$. Also find the angle between the line and the plane.

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6. Find the equation of the plane which contains the line of intersection of the planes $\rightarrow r\hat{i} + 2\hat{j} + 3\hat{k} - 4 = 0$, $\rightarrow r2\hat{i} + \hat{j} - \hat{k} + 5 = 0$and which is perpendicular to the plane

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7. Find the equation of plane(s) passing through the intersection of planes $x + 3y + 6 = 0$ and $3x - y - 4z = 0$ and whose perpendicular distance from origin is unity.

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8. Find the equation of the plane through the pont A(1,2,1) and perpendicular to the line joining the points P(1,4,2) and Q(2,3,5). Also find the distance of this plane from the line $\frac{x+3}{2} = \frac{y-5}{-1} = \frac{z-7}{-1}$

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9. Find the distance of the point P(6,5,9) from the plane determined by the points $A(3, -1, 2)$, $B(5, 2, 4)$ and $C(-1, -1, 6)$.

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Topic 3 Long Answer Type Questions Ii

1. Derive the equation of a plane in normal form both in the vector and Cartesian form .

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2. Derive the condition for the coplanarity two lines in space both in the vector form and Cartesian form.

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3. Find the vector and Cartesian forms of the equation of the plane passing through the point $(1,\ 2,\ -4)$ and parallel to the lines $\rightarrow r = \left(\hat{i} + 2\hat{j} - 4\hat{k}\right) + \lambda\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right) and\ \rightarrow r = \left(\hat{i} - 3\hat{j} + 5\hat{k}\right) +$ Also find the distance of the point (9, -8, -10) from the plane thus obtained.

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4. Find the equation of the plane passing through the line of intersection of the planes $\rightarrow r\hat{i}+\dot{\hat{j}}+\hat{k}=1$and $\rightarrow r2\hat{i}+3\dot{\hat{j}}-\hat{k}+4=0$and parallel to x-axis.

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5. Find the distance between the point $(7, 2, 4)$ and the plane determined by the points $a(2, 5, -3)$, $B(-2, -3, 5)$ and $C(5, 3, -3)$.

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

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

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8. Find the distance of the point (2,12,5) from the point of intersection of the lines $\vec{r} = \left(2\hat{i} - 4\hat{j} + 2\hat{k}\right) + \lambda\left(3\hat{i} + 4\hat{j} + 2\hat{k}\right)$ and the plane $r \cdot \left(\hat{i} - 2\hat{j} + \hat{k}\right) = 0$

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9. Find the equation of the plane that contains the point A(1,-1,2) and is perpendicular to both the planes $2x + 3y - 2z = 5$ and $x + 2y - 3z = 8$. Hence, find the distance of the point $P(-2, 5, 5)$ from the plane obtained above

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10. Show that the lines $\frac{x+3}{-3}=\frac{y-1}{1}=\frac{z-5}{5}$ and $\frac{x+1}{-1}=\frac{y-2}{2}=\frac{z-5}{5}$ and are coplanar. Also, find the equation of the plane containing these lines.

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11. Find the coordinates of the point where the line through $(3, -4, -5)$ and (2-3,1) crosses the plane passing through the points (2,2,1),(3,0,1) and (4,-1,0).

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12. Find the equation of the plane through the line of intersection of the planes $\rightarrow r\hat{i}+3\hat{j}+6=0\, and\, \rightarrow r3\hat{i}-\hat{j}-4\hat{k}=0,$ which is at a unit distance from the origin.

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13. Find the vector equation of the plane passing through three points with position vectors $\hat{i}+\hat{j}-2\hat{i}-\hat{j}+\hat{k}$ and $\hat{i}+2\hat{j}+\hat{k}$. Also find the coordinates of the point of intersection of this plane and the line $\vec{r}=3\hat{i}-\hat{j}-\hat{k}+\lambda\left(2\hat{i}-2\hat{j}+\hat{k}\right)$.

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14. Find the equation of the plane determined by the points $(A(3,-1,2), B(5,2,4)$ and $C(-1,-1,6)$. Also find the distance of the point $P(6,5,9)$ from the plane.

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

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16. Equation of the plane that contains the lines $r = \left(\hat{i} + \hat{j}\right) + \lambda\left(\hat{i} + 2\hat{j} - \hat{k}\right)$ and , $r = \left(\hat{i} + \hat{j}\right) + \mu\left(-\hat{i} + \hat{j} - 2\hat{k}\right)$ is

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17. If the lines $\frac{x-1}{-3} = \frac{y-2}{-2y} = \frac{z-3}{2}$ and $\frac{x-1}{k} = \frac{y-2}{1} - \frac{z-3}{5}$ are perpendicular, find the value of k and hence find the equation of plane containing these lines.

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18. Find the vector and cartesian equations of a plane containing the two lines $\vec{r} = \left(2\hat{i} + \hat{j} - 3\hat{k}\right) + \lambda\left(\hat{i} + 2\hat{j} + 5\hat{k}\right)$ and $\vec{r} = \left(3\hat{i} + 3\hat{j} + 2\hat{k}\right) + \lambda\left(3\hat{i}\right.$. Also show that the line $\vec{r} = \left(2\hat{i} + 5\hat{j} + 2\hat{k}\right) + p\left(3\hat{i} - 2\hat{j} + 5\hat{k}\right)$ lies in the plane.

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19. 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 $\vec{r}\,\hat{i} - \hat{j} + \hat{k} = 5$.

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20. Find the equation of the plane passing through the line of intersection of the planes 2x + y - Z = 3,5x - 3y + 4z + 9 = 0 and parallel to the line $\frac{x-1}{2} = \frac{y-3}{4} = \frac{z-5}{5}$

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21. Find the vector equation of the plane which contains the line of intersection of the plane $\vec{r}\,\hat{i} + 2\hat{j} + 3\hat{k} - 4 = 0$ and $\vec{r}\,2\hat{i} + \hat{j} - \hat{k} + 5 = 0$ and which is perpendicular to the plane $\vec{r}\,5\hat{i} + 3\hat{j} - 6\hat{k} + 8 = 0$.

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22. Find the coordinates of the foot of the perpendicular and the perpendicular distance from the point P(3,2,1) to the plane $2x - y + z + 1 = 0$.

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23. Find the equation of the plane passing through the point P(1,1,1) and containing the line $\vec{r} = \left(-3\hat{i} + \hat{j} + 5\hat{k} \right) + \lambda\left(3\hat{i} - \hat{j} - 5\hat{k} \right)$. Also, show that the plane contains the line $\vec{r} = \left(-\hat{i} + 2\hat{j} + 5\hat{k} \right) + \mu\left(\hat{i} - 2\hat{j} - 5\hat{k} \right)$.

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