MATHS

BOOKS - PRADEEP PUBLICATION

THREE DIMENSIONAL GEOMETRY

Example

1. Find λ so that the distance between the points $(5, -1, -5)$ and $(2, 3, \lambda)$ be 13 units.

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2. Find the points on Y-axis which are at a distance of $\sqrt{29}$ from the point (2,-1,3).

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3. Find the equation to the locus of a point whose distance from the (-1,3,4) is 12.

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4. Find the points of trisection of the segment joining the points A(4,-1,5) and B(-5,5,-7).

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5. Show that the points : (4, 7, 8), (2, 3, 4), (- 1, - 2, 1), (1, 2, 5) are the vertices of a parallelogram.

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6. Find the point which is equidistant from the points (1,0,0), (0,2,0),(0,0,3) and (0,0,0).

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7. Show that the three points A(2,3,4) and B(-1,2,-3) and C(-4,1,-10) are collinear and find the ratio in which C divides [AB].

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8. Find the angle at which the vector $\vec{v} = 2\hat{i} - 6\hat{j} + 2\hat{k}$ is inclined to each of the coordinate axes.

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9. Find the direction cosines of the ray form P to Q where P is point (1,-2,2) and Q is te point (3,-5,-4).

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10. Find the position vector of a point A in space such that $\overrightarrow{OA}$ is inclined at 60° to OX and at 45° to OY and $\left|\overrightarrow{OA}\right| = 10 units$.

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11. Find the direction cosines of the line jonining the ponts P(4,3,-5) and Q(-2,1,-8).

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

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13. If a line has direction ratios $< 2, -1, -2 >$, then what are its direction cosines?

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14. the direction cosines of a line equally inclined to the co-ordinate axes are:

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15. Find the vector equation for the line passing through the points (–1, 0, 2) and (3, 4, 6).

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

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17. Find the vector and the Cartesian equations of the line through the point (5, 2, – 4) and which is parallel to the vector $3\hat{i} + 2\hat{j} - 8\hat{k}$

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18. Show that the points A(2,3,4),B(-1,2,-3) and C(-4,1,-10) are collinear. Find the equations of the line in which they lie.

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19. Find the points on the line through the points A(1,2,3) and B(5,8, 15) at a distance of 14 units from the mid point of AB.

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20. Find the points on the line $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ at a distance of 5 units from the point (1,3,3).

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21. Show that the two lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ intersect each other . Find also the point of intersection.

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22. Check whether the lines $\vec{r} = \hat{i} + \hat{j} - \hat{k} + \lambda\left(3\hat{i} - \hat{j}\right)$ and $\vec{r} = 4\hat{i} - \hat{k} + \mu\left(2\hat{i} + \hat{k}\right)$ intersect or not.

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23. Find the equations of the line intersecting the lines $\frac{x-a}{1}=\frac{y}{1}=\frac{z-a}{1}$ and $\frac{x-a}{2}=\frac{y}{1}=\frac{z+a}{2}$ and parallel to the line $\frac{x-a}{2}=\frac{y-a}{1}=\frac{z-2a}{2}$.

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24. Find the angle between the lines

$\vec{r}=2\hat{i}+3\hat{j}-4\hat{k}+\lambda\left(2\hat{i}+1\hat{j}+2\hat{k}\right)$ and

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

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25. Find the angle between the lines

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

$\vec{r}=8\hat{i}-2\hat{j}+\mu\left(3\hat{i}+2\hat{j}+5\hat{k}\right)$.

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26. Find the angle between the lines

$$\frac{x-3}{2}=\frac{y-5}{3}=\frac{z+5}{4} \text{ and } \frac{x+3}{1}=\frac{y-4}{2}=\frac{z-5}{1}.$$

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27. Find the angle between the lines whose direction cosines are given by the equations $3l+m+5n=0, 6mn-2nl+5lm=0$

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28. A variable line in two adjacent positions has direction cosines $<l, m, n>$ and

$<l+\sigma l$, m+σm, n+$\sigma n>$. Show that the small angle $\sigma\theta$ between the two positions is given by $\sigma\theta^2=\sigma l^2+\sigma m^2+\sigma n^2$.

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29. Prove that the angle between any two diagonals of a cube is $\cos^{-1}\frac{1}{3}$

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30. Evaluate

$$\int e^{2x} \sin 3x$$

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

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

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33. Find the vectoer and cartesian equations of the line through the point (1,2,-4) and perpendicualr of the lines: $\vec{r} = \left(8\hat{i} - 19\hat{j} + 10\hat{k}\right) + \lambda\left(3\hat{i} - 16\hat{j} + 7\hat{k}\right)$ and $\vec{r} = \left(15\hat{i} + 29\hat{j} + 5\hat{k}\right)$

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34. Find the equation of the two lines through the origin which intersect the line $\frac{x-3}{2} = \frac{y-3}{1} = \frac{z}{1}$ at angle of $\frac{\pi}{3}$ each.

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35. Verify that $< \frac{l_1 + l_2 + l_3}{\sqrt{3}}, \frac{m_1 + m_2 + m_3}{\sqrt{3}}, \frac{n_1 + n_2 + n_3}{\sqrt{3}} >$ can be taken as the direction cosines of a line L equally inclined to three mutually perpendicular lines with direction cosines: `, , `

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36. Prove that the lines, whose direction cosines are given by $al + bm + cn = 0, fmn + gnl + hlm = 0$ are: perpendicular if $\frac{f}{a} + \frac{g}{b} + \frac{h}{c} = 0$

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37. Prove that the lines whose direction cosines are given by

al+bm+cn=0, fmn+gnl+hlm=0 are

parallel if $a^2f^2 + b^2g^2 + c^2h^2 - 2(bcgh + cahf + abfg) = 0.$

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38. Find the S.D (shortest distance) between the two given lines $\vec{r} = \hat{i} + \hat{j} + \lambda\left(2\hat{i} - \hat{j} + \hat{k}\right)$ and $\vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu\left(3\hat{i} - 5\hat{j} + 2\hat{k}\right)$

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39. Find the shortest distance between the lines. $\frac{x-8}{3}.\frac{y+9}{-16}=\frac{z-10}{7}$ and $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$.

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40. 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. Also find the equation of the plane containing the lines.

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41. Find the value of equation of a line passing through the point (2,3,2) and parallel to the line $\vec{r}=\left(-2\hat{i}+3\hat{j}\right)+\lambda\left(2\hat{i}-3\hat{j}+6\hat{k}\right)$. Also , find the distance between these two lines

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42. Find the shortest distance between the following lines whose vector equations are :

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

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43. A line passing through the point A with position vector $\vec{a} = 4\hat{i} + 2\hat{j} + 2\hat{k}$ is parllel to the vector $\vec{b} = 2\hat{i} + 3\hat{j} + 6\hat{k}$.Find the length of the perpendicular drawn on this line from a point P with position vector $\vec{r}_1 = \hat{i} + 2\hat{j} + 3\hat{k}$.

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44. Find the equations of the perpendicular drawn from the point (2,4,-1) to the line : $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$

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45. Find shortest distance between lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$

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46. Find the general solution of the following

$(1-\cos x)dy=y^3dx$

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47. Find the direction cosines of the perpendicular from the origin to the plane $\vec{r}.\left(2\hat{i}+2\hat{j}-6\hat{k}\right)+1=0.$

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48. If the line drawn from the point (-2,-1,-3) meets a plane at right angles at the point (1,-3,3), find the eqution of the plane.

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49. 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 <2,2,1>,

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50. Find the equation of the plane through the line points (1,1,0),(1,2,1) and (-2,2,-1).

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51. Show that the points (1,-1,1),(2,3,1),(1,2,3) and (0,-2,3) are coplanar. Find the equation of the plane in which they lie.

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52. Find the vector equations of the plane which is at a distance of 7 from the origin and its normal vector from the origin is $2\hat{i} - 6\hat{j} + 3\hat{k}$.

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53. A plane meets the coordinate axes in points A,B,C and the centroid of the triangle ABC is (α, β, γ), find the equation of the plane.

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54. Find the vector equation of the line passing through the point (1,2,1) and perpendicular to the plane $\vec{r}.\left(2\hat{i} - \hat{j} + \hat{k}\right) = 10$. Find the point of intersection of this line and the plane.

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55. Find the ratio in which the plane x-2y+3z=17 divides the line joining the points (-2,4,7) and (3,-5,8). Also obtain the coordinates of the point of intersection.

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56. Find the vector equation in scalar product form of the plane $\vec{r} = 2\hat{i} - \hat{j} + \lambda\left(\hat{i} + 2\hat{j} + 3\hat{k}\right) + \mu\left(2\hat{i} - \hat{j} - 3\hat{k}\right)$.

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57. A variable plane passes through a fixed point a,b,c and meet the co-ordinates axes in A,B,C. Show that the locus of the point common to the planes through A,B,C parallel to the co-ordinate planes is $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 1$

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58. Find the coordinates of the point where the line through $(3, 4, 1)$ and $(5, 1, 6)$ crosses XY-plane.

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59. Find the vector equation of the plane passing through three points with position vectors $\hat{i} + \hat{j} - 2\hat{k}, 2\hat{i} - \hat{j} + \hat{k}$ and $\hat{i} + 2\hat{j} + \hat{k}$. Also find the co-ordinates 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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60. Find the equation in vector anf cartesian form of the line passing through the point : (2,-1,3) 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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61. Find the equation of the plane containing the line $\frac{x+2}{2} = \frac{y+3}{3} = \frac{z-4}{-2}$ and the point (0,6,0).

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62. Find the equation of the plane passing through the points (-1,2,0), (2,2,-1) and parallel to the line $\frac{x-1}{1} = \frac{2y-1}{2} = \frac{z+1}{-1}$

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63. Find the general solution of the following Differential equation

$\left(x^2 + 3x + 12\right)dy = ydx$

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64. Show that the lines

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

are coplanar.

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65. If the line $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect, then k is equal to

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66. Find the distance of the point (1,-2,3) from the plane $x-y+z=5$ measured parallel to the line $\frac{x}{2}=\frac{y}{3}=\frac{z}{-6}$.

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

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68. Find the distance of the point (-1, -5, -10) from the point of intersection of the $\frac{x-2}{3}=\frac{y+1}{4}=\frac{z-2}{12}$ and the plane x-y + z= 5.

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69. Find the length and the foot of perpendicular from the point $\left(1, \frac{3}{2}, 2\right)$ to the plane 2x-2y+4z+5=0.

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70. Find the coordinates of the foot of the perpendicular drawn from the origin to the plane $2x-3y+4z-6=0$

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71. Find the equation of the line passing through the point (3,0,1) and parallel to the planes x+2y=0 and 3y-z=0.

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72. Find the equations of the line passing through the point (-4,3,1) perpendicular to the plane $x + 2y - z = 0$.

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73. The image of the line $\frac{x-1}{3} = \frac{y-3}{1} = \frac{z-4}{-5}$ in the plane $2x - y + z + 3 = 0$ is the line

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

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75. Find the acute angle between the planes

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

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76. Find the vector equation of the plane through the points (2,1,-1) and (-1,3,4) and perpendicular to the plane $x-2y+4z=10.$

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77. Find the equation of the plane through the point (-1, -1, 2) and perpendicular to the planes 3x + 2y - 3z = 1 and 5x -4y + z = 5.

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78. 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.

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79. Find the angle between the line $\vec{r} = \left(\hat{i} + 2\hat{j} - \hat{k}\right) + \lambda\left(\hat{i} - \hat{j} + \hat{k}\right)$ and the plane $\vec{r}.\left(2\hat{i} - \hat{j} + \hat{k}\right) = 4.$

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80. Find the angle between the line : $\frac{x+1}{2} = \frac{y}{3} = \frac{z-3}{6}$ and the plane $10x + 2y - 11z = 3.$

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81. A variable plane which remains at a constant distance p from the origin cuts the co-ordinate axes at A, B, C. Through A,B,C planes are drawn

parallel to the co-ordinate planes. Show that locus of the point of intersection is : $x^{-2}+y^{-2}+z^{-2}=p^{-2}$

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82. Find the equation of the plane which passes through the point (3,4,-1) and is parallel to the plane 2x-3y+5z+7=0. also, find the distance between the two planes.

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83. Show that the line L whose vector equation is $\vec{r}=2\hat{i}-2\hat{j}+3\hat{k}+\lambda\left(\hat{i}-\hat{j}+4\hat{k}\right)$ is parallel to the plane π whose vector equation is $\vec{r}\cdot\left(\hat{i}+5\hat{j}+\hat{k}\right)=5$ and find the distance between them.

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84. Find the equation of the plane mid parallel to the planes 3x-4y+12z-26=0 and 3x-4y+12z+13=0.

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85. A variable plane which remains at a constant distance 3p from the origin cuts the coordinate axes at A,B,C. show that the locus of the centroid of the triangle ABC is $x^{-2}+y^{-2}+z^{-2}=p^{-2}$.

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86. Find the distane of the point $P\left(\hat{i}+\hat{j}+\hat{k}\right)$ from the plane through the points $A\left(2\hat{i}+\hat{j}+\hat{k}\right), B\left(\hat{i}+2\hat{j}+\hat{k}\right)$ and $C\left(\hat{i}+\hat{j}+2\hat{k}\right)$

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

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

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89. Find in symmetrical form, the equations of the line

$2x-2y+3z-2=0, x-y+z+1=0.$

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90. Find the equation of the plane passing through the line of intersection of the planes 2x-y=0 and 3z-y=0 and perpendicular to the

plane 4x+5y-3z=8

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

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

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93. Find the equations of the bisector planes of the angle between the planes : $3x-2y+6z+8=0$ and $2x-y+2z+3=0$

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94. Find in symmetrical form, the equations of the line

$2x - 2y + 3z - 2 = 0, x - y + z + 1 = 0.$

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95. Prove that the line of section of the planes $2x - y + z = 4$ and $5x + 7y + 2z = 0$ meets the plane $3x + 4y - 2z + 3 = 0$ in a single point. Find the cooridnates of that point.

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96. Find the cartesian and vector equations of the planes passing through the intersection of te planes $\vec{r} \cdot \left(2\hat{i} + 6\hat{j}\right) + 12 = 0$ and $\vec{r} \cdot \left(3\hat{i} - \hat{j} - 4\hat{k}\right) = 0$ which are at a unit distance from the origin.

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97. The plane $ax + by = 0$ is rotated through an angle α about its line of intersection with the plane $z = 0$. Show that the equation to the plane in new position is $ax + by \pm z\sqrt{a^2 + b^2}\tan\alpha = 0$.

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Exercise

1. Find the points on z-axis which are at a distance of $\sqrt{21}$ from the point (1,2,3).

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2. Find k so that the distance between the points (7, 1, - 3) and (4,5, k) be 13 units.

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3. Find the point on x-axis which is equidistant from the point (1,3,2) and (5,5,2).

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4. Find the point which is equidistant from the points (a,0,0),(0,b,0),(0,0,c) and (0,0,0),a,b and c being non-zero reals.

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5. Show that the points (2,4,3),(4,1,9) and (10,-1,6) are the vertices of an isosceles right angled triangle.

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6. Find the locus of a point which is equidistant from the points (3,2,1) and (-1,2,3).

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7. Find the point in the XY-plane which is equidistant from the points (2,0,3),(0,3,2) and (0,0,1).

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8. Prove that the point A (0,0,0),B(2,0,0),$C\left(1, \sqrt{3}, 0\right)$ and $D\left(1, \frac{1}{\sqrt{3}}, \frac{2\sqrt{2}}{\sqrt{3}}\right)$ are the vertices of a regular tetrahedron.

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9. Find the coordinates of the point which divides the join of the points (2,-1,3) and (4,3,1) in the ratio 3:4 internally.

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10. Find the points on the line segment PQ situated at

$\frac{2}{3}$ of the distance from the initial point P to the final point Q, where

$P = (3, 1, 7), Q = (-2, 5, 3).$

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11. Find the points on the line segment PQ situated at

$\frac{2}{3}$ of the distance from the initial point P to the final point Q, where

$P = (3, 1, 7), Q = (-2, 5, 3).$

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12. If A and B are two points whose position vectors are $3\hat{i} + 2\hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} - \hat{k}$ respectively. Find the position vectors of the points dividing the segment AB

internally in the ratio 1:3.

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13. If A and B are two points whose position vectors are $3\hat{i} + 2\hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} - \hat{k}$ respectively. Find the position vectors of the points dividing the segment AB

externally in the ratio 3:1.

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14. Find the coordinates of the point which is three fifth of the way (3,4,5) to (-2,-1,0).

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15. Find the ratio in which the line segment joining : (1,2,3) and (-3,4,-5) is divided by the xy-plane.

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16. If A and B are the points (-3,4,-8) and (5,-6,4) respectively, find the ration in which YZ-plane divides [AB]. Also find the coordinates of the point of section.

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17. Using section formula, prove that the three points (-2,3,5),(1,2,3) and (7,0,-1) are collinear.

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18. Show that the points : (4, 7, 8), (2, 3, 4), (- 1, - 2, 1), (1, 2, 5) are the vertices of a parallelogram.

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19. Using vectors, show that the medians of a triangle are concurrent.

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20. Prove that the points A(5,0,2), B(2,-6,0),C(4,-9,6) and D(7,-3,8), taken in order, form a square of area 49 square units.

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21. If three consecutive vertices of a parallelogram are (3,4,-1),(7,10,-3) and (8,1,0), find the fourth vertex.

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22. The ends of a side of a parallelogram are (2,5,-3),(3,7,-5) and its diagonals meet in (4,3,3). Find the remaining vertices of the parallelogram.

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23. The mid-points of the sides of a triangle are (5,7,11),(0,8,5) and (2,3,-1). Find the coordinates of the vertices of the triangle.

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24. Two vertices of a traingle are (2,-6,4) and (4,-2,3) and its centroid is $\left(\frac{8}{3}, -1, 3\right)$. Find the third vertex.

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25. Find the coordinates of the centroid of a triangle the mid points of whose sides are (1,2,-3), (3,0,1) and (-1,1,-4)

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26. A (3, 2, 0), B(5, 3, 2), C(- 9, 6, -3) are three points forming a triangle. AD, the bisector of $anl \geq BAC$ meets [BC] at D. Find the co-ordinates of D.

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27. Calculate the cosine of the angle A of the triangle with vertices A(1,-1,2), B(6,11,2),C(1,2,6).

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28. The direction ratios of a vector are <1,-3,-2>, find its direction cosines.

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29. Find the direction cosines of the vectors:

$2\hat{i} + 2\hat{j} - \hat{k}$

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30. Find the direction cosines of the vectors:

$6\hat{i} - 2\hat{j} - 3\hat{k}$

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31. Find the direction cosines of the vectors:

$3\hat{i} + 4\hat{k}$

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32. Find the direction cosines of the vectors:

$\hat{k}$

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33. Find the angles at which the following vectors are inclined to each of the coordinates axes:

$\hat{i} - \hat{j} + \hat{k}.$

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34. Find the angles at which the following vectors are inclined to each of the coordinates axes:

$4\hat{i} + 8\hat{j} + \hat{k}.$

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35. Find the angles at which the following vectors are inclined to each of the coordinates axes:

$\hat{j} - \hat{k}$

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36. Find the angles at which the following vectors are inclined to each of the coordinates axes:

$\hat{i}$

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37. Can a vector have direction angles $45^\circ, 60^\circ$ and 120°?

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38. A line makes angles 45° and 60° with the positive direction of the axis of x and y makes with the positive direction of z axis, an angle of:

A. 60°

B. 120°

C. 60° or 120°

D. none

Answer:

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39. If a line makes angles $90^\circ, 60^\circ$ and 30° with the positive direction of x,y and z-axis reapectively, then direction cosines are

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40. A line passes through the points $(6, -7, -1) and (2, -3, 1)$. Find the direction cosines of the line if the line makes an acute angle with the positive direction of the x-axis.

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41. A vector $\vec{r}$ has length 14 and direction numbers <2,6,-3>. Find the direction cosines and components of $\vec{r}$.

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42. A vector $\vec{v}$ is inclined at equal angles to the positive directions of the three coordinate axes. If the magnitude of $\vec{v}$ is 6 units, find $\vec{v}$.

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43. Show that the line joining the mid points of two sides of a triangle is parallel to the third side.

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

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45. The Cartesian equation of a line is $\frac{x+3}{2}=\frac{y-5}{4}=\frac{z+6}{2}$. Find the vector equation for the line.

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

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47. Find the vector equation for the line through the points A(3,4,-7) and B(1,-1,6).

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48. The cartesian equation of a line is $6x - 2 = 3y + 1 = 2z - 2$. Find : (a) the direction-ratios of the line, and (b) vector equation of the line parallel to this line and· passing through the point (2, - 1, - 1).

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49. Find the equations of a line through A(1,-1,0) and parallel to the line $\frac{x-2}{3} = \frac{2y+1}{2}, \frac{5-z}{1}$.

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50. 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 side AB and BC and also find the coordinates of point D .

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51. Show that the two lines $\frac{x-5}{4} = \frac{y-7}{4} = \frac{z+3}{-5}$ and $\frac{x-8}{7} = \frac{y-4}{1} = \frac{z-5}{3}$ intersect each other . Find also the point of intersection.

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52. 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 each other. Also find their point of intersection.

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53. Prove that the line through A(0,-1,-1) and B(4,5,1) intersects the line through C(3,9,4) and D(-4,4,4). Also find their point of intersection.

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54. Show by direction numbers that the points (-2,4,7),(3,-6,-8) and (1,-2,-2) are collinear.

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55. Find the equation of the line passing through the points A(-2,4,7), B(3,-6,-8). Hence show that the points A,B and C(1,-2,2) are collinear.

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56. Evaluate

$$\int (2x+5)\frac{dx}{x^2+4x+5}$$

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57. Find the point on the line $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ at a distance of $3\sqrt{2}$ from the point (1,2,3).

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58. Find the angle between the pairs of line with direction ratios

$< 5, -12, 13 >$, $< -3, 4, 5 >$

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59. Find the angle between the pair of lines with directions ratios:

<1,1,2>, $<\sqrt{3}-1, -\sqrt{3}-1, 4>$

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60. If P,Q are (2,3,-6),(3,-4,5), then find the acute angle that OP makes with OQ.

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61. Find the angles between each of the following pairs of lines:

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

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

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62. Find the angle between the followig 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 perpendicuar.

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63. Find the angles between each of the following pairs of lines:

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

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64. The angle between a line with direction ratios proportional to $2, 2, 1$ and a line joining $(3, 1, 4)$ and $(7, 2, 12)$ is

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65. Find the angle between the following pair of lines : $\vec{r}=\hat{i}+\hat{j}-\hat{k}+\lambda\left(\hat{i}-3\hat{j}+2\hat{k}\right), \vec{r}=2\hat{i}-\hat{j}+\hat{k}+\mu\left(3\hat{i}+\hat{j}-2\hat{k}\right)$

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66. Find the angle between the lines whose direction cosines are given by the equations:

l-5m+3n=0

$7l^2 + 5m^2 - 3n^2 = 0.$

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67. Find the angle between the lines whose direction cosines are given by the equations:

2l-m+2n=0

mn+nl+lm=0.

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68. Differentiate the following

$y = \tan(\sin(a^x))$

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69. Find the angle of the tirangle ABC whose vertices are A(-1,3,2), B(2,3,5) and C(3,5,-2).

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70. Find the length of the perpendicular from the point (1,2,3) to the line : $\frac{x-6}{3}=\frac{y-7}{2}=\frac{z-7}{-2}$

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71. 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 find the co ordinates of the foot of the perpendicular.

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72. Find the equations of the perpendicular drawn from the point (2,4,-1) to the line : $\frac{x+5}{1}=\frac{y+3}{4}=\frac{z-6}{-9}$

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73. Find the length and foot of perpendicular drawn from the point (2,-1,3) to the line

$\frac{x-11}{10}=\frac{y+2}{-4}=\frac{z+8}{-11}$

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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 $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$.

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75. Find the equation in vector anf cartesian form of the line passing through the point : (2,-1,3) 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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76. Show that, if the axes are rectangular, the equations of the line through (x_1, y_1, z_1) at right angles to the lines: $\frac{x}{l_1} = \frac{y}{m_1} = \frac{z}{n_1}, \frac{x}{l_2} = \frac{y}{m_2} = \frac{z}{n_2}$ are $\frac{x - x_1}{m_1 n_2 - m_2 n_1} = \frac{y - y_1}{n_1 l_2 - n_2 l_1} = \frac{z - z_1}{l_1 m_2 - l_2 m_1}$

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77. Find the coordinates of the foot of the perpendicular drawn from point $A(1, 0, 3)$ to the join of points $B(4, 7, 1)$ and $C(3, 5, 3)$.

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78. A(1,0,4), B(0,-11,3), C(2,-3,1) are three points and D is the foot of the perpandicular from A on BC. Find the coodinates of D.

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79. Find the equation of the line joining the points A(0,-1,3) and B(2,-3,-1).

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80. Find the vector equation of the line joining the points A(1,-1,2) and B(1,-2,0).

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81. Find the image of the point (1,6,3) in the line : $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$.

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82. A line makes angles $\alpha, \beta, \gamma, \delta$ with the diagonals of a cube, prove that

$\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = \frac{4}{3}$

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83. If the edges of a rectangular parallelopiped are a, b and c, show that the angles between the four diagonals are given by $\cos^{-1}\frac{a^2 \pm b^2 \pm c^2}{a^2 + b^2 + c^2}$

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84. Find the general solution of the following

$(1 + \sin x)dy = ydx$

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85. Prove that the two lines whose direction cosines are connected by the relations $al + bm + cn = 0$ and $ul^2 + vm^2 + wn^2 = 0$ are

perpendicular if $a^2(v+w)+b^2(w+u)+c^2(u+v)=0$ and parallel if $\frac{a^2}{u}+\frac{b^2}{v}+\frac{c^2}{w}=0.$

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86. Find the general solution of the following

$(1+\sec x)dy=y^2dx$

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87. Find the shortest distance between two lines whose vector equations are : $\vec{r}=3\hat{i}+8\hat{j}+3\hat{k}+\lambda\left(3\hat{i}-\hat{j}+\hat{k}\right)$ and $\vec{r}=-3\hat{i}-7\hat{j}+6\hat{k}+\mu\left(-3\hat{i}+2\hat{j}+4\hat{k}\right)$

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88. Find the shortest distance between each of the following pair of lines:

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

$\vec{r} = -\hat{i} - \hat{j} - \hat{k} + \mu\left(7\hat{i} - 6\hat{j} + \hat{k}\right).$

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89. Find the shortest distance between each of the following pair of lines:

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

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

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90. Find the general solution of the following

$(\sin x + \cos x)dy = y(\cos x - \sin x)dx$

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91. Find the shortest distance between each of the following pair of lines:

$\vec{r} = (8 + 3t)\hat{i} - (9 + 16t)\hat{j} + (10 + 7t)\hat{k}$ and

$\vec{r} = 15\hat{i} + 29\hat{j} + 5\hat{k} + s\left(3\hat{i} + 8\hat{j} - 5\hat{k}\right).$

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92. Find shortest distance between lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$

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93. Determine whether or not the following paris of lines intersect:

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

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94. Determine whether or not the following paris of lines intersect:

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

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95. Determine whether or not the following paris of lines intersect:

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

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96. Find the general solution of the following

$$\left(1+x^2\right)dy=xydx$$

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97. Find the general solution of the following

$$(e^x+1)dy=y(e^x)dx$$

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98. Show that the lines $\frac{x-1}{23}=\frac{y+1}{2}=\frac{z-1}{5}$ and $\frac{x-2}{4}=\frac{y-1}{3}=\frac{z+1}{-2}$ do not intersect.

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99. Write the vector equation of the following lines and hence find distance between them

$$\frac{x-1}{2}=\frac{y-2}{3}=\frac{z+4}{6}, \frac{x-3}{4}=\frac{y-3}{6}=\frac{z+5}{12}$$

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100. Find the normal unit vector to the plane x+2y+3z-6=0.

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101. Find the unit vector perpendicular to the plane $\vec{r}.\left(6\hat{i}+3\hat{j}-2\hat{k}\right)+1=0$ passing through the origin and directed from origin to the plane.

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102. Find the cartesian equation of the following planes:

$\vec{r}.\left(\hat{i}+\hat{j}+\hat{k}\right)=2$

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103. Find the cartesian equation of the following planes:

$\vec{r}.\left(2\hat{i}-3\hat{j}-4\hat{k}\right)=1$

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104. Find the equations of the line passing through the point (1,-1,2) and perpendicular to the plane 2x-y+3z=5.

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105. Find the equation of the line passing through the point with position vector $\hat{i}-\hat{j}+2\hat{k}$ and perpendicular to the plane $\vec{r}.\left(2\hat{i}-\hat{j}+3\hat{k}\right)=5.$

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106. Find the general solution of the following

$(1+\log x)xdy = ydx$

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107. Find the equation of the plane passing through the point (3,-3, 1) and perpendicular to the line joining the points (3, 4, - 1) and (2, - 1,5). Also find the coordinates of the foot of the perpendicular, the equation of the perpendicular line and the length of perpendicular drawn from the origin to the plane.

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108. Find the equation of a plane which bisects perpendicularly the line segment joining the points A(2,3,4) and B(4,5,8).

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109. Find the equation of the plane through the point (1,4,-2) and parallel to the plane $2x - y + 3z + 7 = 0$.

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110. If the line drawn from (4,-1,2) to the point (-3,2,3) meets a plane at right angles, at the point (-10,5,4), then find the equation of the plane.

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111. Find the equation of the plane through (1,5,-2) and parallel to the plane deterined the points (0,1,1),(1,1,2) and (-1,2,-2).

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112. The position vectors of two points A and B are $3\hat{i}+\hat{j}+2\hat{k}$ and $\hat{i}-2\hat{j}-4\hat{k}$ respectively. Find the equation of the plane passing through B and perpendicular to $\overrightarrow{AB}$

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113. Find the vector equations of the line passing through the point (1,-1,2) and perpendicular to the plane 2x-y+3z-5=0.

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114. Find the vector equation of the line through the origin, which is perpendicular to the plane $\vec{r}\cdot\left(\hat{i}-2\hat{j}+\hat{k}\right)=3$.

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115. The vector equation of a plane is $\vec{r}.\left(2\hat{i}+2\hat{j}-\hat{k}\right)=21$, find the length of the perpendicular from the origin to the plane.

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116. Find the vector equation of a plane which is at a distance of 5 units from the origin and has <2,-1,2> as the direction numbers of a normal to the plane.

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117. Find the vector equation of a line passing through the point with position vector $\left(2\hat{i}-3\hat{j}-5\hat{k}\right)$ and perpendicular to the plane $\vec{r}\cdot\left(6\hat{i}-3\hat{j}-5\hat{k}\right)+2=0$. Also, find the point of intersection of this line and the plane.

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118. The foot of perpendicular drawn from the origin to a plane is (12,-4,-3). Find the equation of the phase.

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119. The foot of perpendicular drawn from the origin to a plane is (2,5,7). Find the vector equations of the plane.

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120. O is the origin and A is (a,b,c). Find the d.c. of OA and the equation of the plane through A at right angles of OA.

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121. Find the equation of the plane whose intercepts on the axes are 3,4,5 respectively.

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122. Find the equation of the plane passing through the point (2,4,6) and making equal intercepts on axes.

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123. A variable plane moves so that the sum of reciprocals of its intercepts on the three coordinate axes is constant, show that it passes through a fixed point.

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124. A plane meets the coordinates axes in A, B and C such that the centroid of the triangle ABC is the point (p, q, r), show that the eqation of the plane is $\frac{x}{p} + \frac{y}{q} + \frac{z}{r} = 3$.

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125. Find the intercepts made by the plane 2x-3y+5z+4=0 on the co-ordinate axes.

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126. Change to normal form the plane 2x-3y+6z+4=0

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127. Find the vector equation of the following planes in scalar product form:

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

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128. 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 $\vec{r} = (s+1)\hat{i} + (2s-1)\hat{j} - (2$

where t and s are scalars.

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129. Find the vector equation of the following plane in scalar product form: $\vec{r} = \hat{i} - \hat{j} + \lambda\left(\hat{i} + \hat{j} + \hat{k}\right) + \mu\left(\hat{i} - 2\hat{j} + 3\hat{k}\right)$

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130. Find the equation satisfied by the coordinates of a variable point P(x,y,z) lying in the plane in which the point A(1,0,2),B(2,2,-1),C(1,1,0) lie

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131. Find the vector equations of the plane passing through the points $R(2, 5, -3), S(-2, -3, 5), T(5, 3, -3)$

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132. Prove that the normal to the plane containing three point whose position vectors are $\vec{a}, \vec{b}, \vec{c}$ lie in the direction of $\vec{b} \times \vec{c} + \vec{c} \times \vec{a} + \vec{a} \times \vec{b}$.

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

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134. Show that the plane whose vector equation is $\vec{r} \cdot \left(\hat{i} + 2\hat{j} - \hat{k}\right) = 3$ contains the line whose vector equation is $\vec{r} = \hat{i} + \hat{j} + \lambda\left(2\hat{i} + \hat{j} + 4\hat{k}\right)$.

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135. Find the equation of the plane through the points (2,2,-1) and (3,4,2) and parallel to the line whose direction ratios are <7,0,6>.

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136. Find the equation of the plane which passes through the line $\frac{x-3}{2}=\frac{y+2}{9}=\frac{z-4}{-1}$ and the point (-6,3,2).

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137. Find the equation of the plane containing the line $\frac{x-3}{7}=\frac{y-4}{0}=\frac{z-2}{1}$ and the point (2,2,-1).

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138. Find the equation of the plane containing the line $\frac{x+1}{-3}=\frac{y-3}{2}=\frac{z+2}{1}$ and the point (0,7,-7).

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139. Find the equation of the plane passing through the point (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: $\vec{r} = \left(-\hat{i} + 2\hat{j} + 5\hat{k}\right) + \lambda\left(\hat{i} - 2\hat{j} - 5\hat{k}\right)$.

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140. Find the equation of the plane which is parallel to the line $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$ and passes through the point (0,0,0) and (3,-1,2).

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141. Find the equation of the plane parallel to the line $\frac{x-2}{1} = \frac{y-1}{3} = \frac{z-3}{2}$, which contains the point (5,2,-1) and passes through the origin.

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142. Evaluate $\int \frac{dx}{\sec x + \tan x}$

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143. Find the equation of the line passing through (1,2,3) and parallel to the planes x-y+2z=5 and 3x+y+z=6.

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144. Find the equation of the plane, which contains two lines: $\frac{x-4}{1} = \frac{y-3}{-4} = \frac{z-2}{5}$ and $\frac{x-3}{1} = \frac{y+2}{-4} = \frac{z}{5}$.

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145. Find the equation of the plane containingg the lines: $\vec{r} = \hat{i} + \hat{j} + \lambda\left(\hat{i} + 2\hat{j} - \hat{k}\right)$ and $\vec{r} = \hat{i} + \hat{j} + \mu\left(-\hat{i} + \hat{j} - 2\hat{k}\right)$.

Find the distance of this plane from origin and also from the point (1,1,1).

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146. Find the vector equation of the line $\frac{x-1}{2}=\frac{y-2}{-3}=\frac{z+3}{4}$.

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147. Find the co-ordinates of the points where the line through the points (3,-4,-5) and (2,-3,1) crosses the plane $2x+y+z=7$

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148. Find the co-ordinates of the point P, where the line through A(3,-4,-5) and B(2,-3,1) crosses the plane passing through three points L(2,2,1), M(3,0,1) and N(4,-1,0). Also, find the ratio in which P divides the line segment AB.

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149. Find the co-ordinates of the points where the line through the points (3,-4,-5) and (2,-3,1) crosses the plane $2x + y + z = 7$

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150. 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 $\vec{r}.\left(\hat{i} - \hat{j} + \hat{k}\right)$=5.

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151. Show that the lines $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$ and $\frac{x}{1} = \frac{y-7}{-3} = \frac{z+7}{2}$ intersect. Find the point of intersection and the equaion of the plane contianing them.

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

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153. Find the length and the foot of the perpendicular from the point $(7, 14, 5)$ to the plane $2x + 4y - z = 2$.

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154. find the length and the foot of perpendicular drawn from the point (1,1,2) to the plane

$\vec{r}.\left(2\hat{i}-2\hat{j}+4\hat{k}\right)+5=0.$

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155. Find image of point $(1, 3, 4)$ in the plane $2x - y + z + 3 = 0$.

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156. Find the image of the point $\hat{i} + 3\hat{j} + 4\hat{k}$ in the plane $\vec{r} \cdot \left(2\hat{i} - \hat{j} + \hat{k}\right) + 3 = 0$.

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157. Find the length and foot of perpendicular drawn from the point (3,2,1) onto the plane 2x-y+z+1=0. also find the equation of the plane in which they lie.

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158. The image of the line $\frac{x-1}{3} = \frac{y-3}{1} = \frac{z-4}{-5}$ in the plane $2x - y + z + 3 = 0$ is the line

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159. Find the projection of the line $\frac{x-1}{2}=\frac{y+1}{-1}=\frac{z-3}{4}$ in the plane x+2y+z-9=0`.

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160. Find the distance of the line $\frac{x+1}{-3}=\frac{y-3}{2}=\frac{z-2}{1}$ in the plane x+y+z+3=0.

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161. The image of the line $\frac{x-1}{3}=\frac{y-3}{1}=\frac{z-4}{-5}$ in the plane $2x-y+z+3=0$ is the line

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162. Find the ratio in which the plane ax+by+cz+d=0 divides the join of the points $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$ lying on the plane. Hence, show that the points P(1,-2,3) and Q(0,0,-1) lie on opposite sides of the plane 2x+5y+7z=3.

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163. Show that the lines $\frac{x-a+d}{\alpha-\delta}=\frac{y-a}{\alpha}=\frac{z-a-d}{\alpha+\delta}$ and $\frac{x-b+c}{\beta-\gamma}=\frac{y-b}{\beta}=\frac{z-b-c}{\beta+\gamma}$ are coplanar.

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164. Find the angle between the planes $2x-3y+4z=1$ and $-x+y=4$.

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165. Find the angle between the planes:

$\vec{r}.\left(\hat{i}+\hat{j}\right)=1$ and $\vec{r}.\left(\hat{i}+\hat{k}\right)=3.$

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166. Find the angle between the two planes $3x-6y+2z=7$ and $2x+2y-2z=5$

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167. Show that the plane passing through the points (1,1,1), (1,-7,1) and (-7,-3,-5) is perpendicular to zx-plane.

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

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

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170. Find the equation of the plane passing through the line $\frac{x-1}{2} = \frac{y+1}{1} = \frac{z-3}{4}$ and perpendicular to the plane $x + 2y - z = 12$.

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171. Obtain the equation of the plane passing through the point (1,-3,-2) and perpendicular to the plane $x + 2y + 2z = 5$ and $3x + 3y + 2z = 8$.

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172. Find the angles between the line $\vec{r} = -\hat{i} + \hat{j} + 2\hat{k} + \lambda\left(3\hat{i} + 2\hat{j} + 4\hat{k}\right)$ and the plane $\vec{r}.\left(2\hat{i} + \hat{j} - 3\hat{k}\right) + 4 = 0$

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173. Find the co-ordinates 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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174. The distance of the point (2,1,-1) from the plane $x - 2y + 4z = 9$ is :

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

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176. Find the equations of two planes through the point $(4, 2, 1), (2, 1, -1)$ and making angles $\frac{\pi}{4}$ with the plane $x - 4y + z = 9$.

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177. Find the length of the projection of the line segment joining the point $A(-1, 2, 0)$ and $B(1, -1, 2)$ on the plane $2x - y - 2z - 4 = 0$

.

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178. Show that the line L whose vector equation is $\vec{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda\left(\hat{i} - \hat{j} + 4\hat{k}\right)$ is parallel to the plane π whose vector equation is $\vec{r} \cdot \left(\hat{i} + 5\hat{j} + \hat{k}\right) = 5$ and find the distance between them.

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179. Find the equation of plane passing through the point (1,4,-2) and parallel to the plane $2x - y + 3z = 0$

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180. Find the equation of the planes parallel to the plane $x - 2y + 2z - 3 = 0$ and which is at a unit distance from the point $A(1, 1, 1)$.

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181. The planes $2x - 2y + 4z + 5 = 0$ and $3x - 3y + 6z - 1 = 0$ are

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182. Find the distance between the parallel planes 2x-y+3z+4=0 and 6x-3y+9z+13=0.

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183. Show that the equation of the plane through the line $\frac{x}{l}=\frac{y}{m}=\frac{z}{n}$ and perpendicular to the plane containing non perpendicular lines $\frac{x}{m}=\frac{y}{n}=\frac{z}{l}$ and $\frac{x}{n}=\frac{y}{l}=\frac{z}{m}$ is $(m-n)x+(-l)y+(l-m)z=0.$

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184. Two systems of rectangular axes have the same origin. If a plane cuts them at distance a, b, c and a', b', c' respectively form the origin, prove that $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}=\frac{1}{a'^2}+\frac{1}{b'^2}+\frac{1}{c'^2}.$

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185. Show that the points $P\left(\hat{i}-\hat{j}+3\hat{k}\right)$ and $Q\left(3\hat{i}+3\hat{j}+3\hat{k}\right)$ are equidistant from the plane $\overrightarrow{r}.\left(5\hat{i}+2\hat{j}-7\hat{k}\right)+9=0$ and lie on opposite sides of it.

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186. Find in parametric form, the equations of the line x+y+z+1=0, 4x+y-2z+2=0.

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187. Find the equation of the plane through the line of intersection of the planes x+2y+3z+4=0 and x-y+z+3=0 and passing through the origin.

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188. Find the equation of the plane containing the line of intersection of the plane $x+y+z-6=0$ and $2x+3y+4z+5=0$ and passing

through the points $(1, 1, 1)$.

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189. Find the vector quation of the plane containing the line of intersection of the planes x-3y+4z-5=0 and 2x-y+3z-1=0 and passing through the point (1,-2,3).

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190. Find the equation of the plane which is perpendicular to the plane 5 x + 3y + 6 z +8 = 0 and which contains the line of intersection of the planes x + 2 y + 3z-4-0 and 2x+y-z+5 -0.

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191. Find the equation of the plane bisectiing the angles between the planes: $x + 2y + 2z - 3 = 0, 3x + 4y + 12z + 1 = 0$ and specify the

plane, which bisects the acute angle.

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192. Show that the lines $\frac{x+4}{3}=\frac{y+6}{5}=\frac{z-1}{-2}$ and $3x-2y+z+5=0=2x+3y+4z-4$ intersect. Find the equation of the plane in which they lie and also their point of intersection.

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193. Prove that the line of section of the planes 5x+2y-4z+2=0 and 2x+8y+2z-1=0 is parallel to the plane 4x-2y-5z-2=0.

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194. Find the equations of the line through the point (1,2,4) and parallel to the line 3x+2y-z=4, x-2y-2z=5.

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195. Find the angle between the lines: $x - 2y + z = 0 = x + 2y - 2z$ and $x + 2y + z = 0 = 3x + 9y + 5z$.

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196. Prove that the lines x=py+q, z=ry+s and x=p'y+q'z=r'y+s' are at right angles if pp'+rr'+1=0.

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197. Find the equations of the plane through the intersection of the planes $\vec{r}.\left(\hat{i} - 1\hat{j}\right) = -6$ and $\vec{r}.\left(3\hat{i} + 3\hat{j} - 4\hat{k}\right) = 0$, whose perpendicular distance form the origin is unity.

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198. Find the equations of the plane which contains the line of intersections of the planes

$\vec{r}.\left(\hat{i}-2\hat{j}+3\hat{k}\right)-4=0$ and $\vec{r}.\left(-2\hat{i}+\hat{j}+\hat{k}\right)+5=0$ and whose intercept on x-axis is equal to the on y-axis.

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199. If a line makes angles of $90^\circ, 60^\circ$ and θ with the x, y and z axis respectively,where θ is acute, find its θ

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200. Name the locus of the equation $x^2+y^2=0$.

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201. What is the locus of the equations $x^2+y^2+z^2=0$?

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202. Write the direction cosines of the Y-axis.

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203. What is the shortest distance between two intersecting lines?

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204. Direction cosines of $\hat{i}$ are '

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205. Write down direction cosines of the line $\frac{1-x}{1} = \frac{y-2}{1} = \frac{z-3}{1}$.

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206. What is the angle between the planes $x + y = 0$ and $z = 0$.

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207. Name the surface represented by the equation ax+by+cz+d=0, where $a^2 + b^2 + c^2 = 0$.

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208. Write the attitude numbers of the plane 2x-3y+4z-13=0.

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209. Find p if the planes 2x+3y+6z-13=0 and 6x+py-3z=0 are at right angles.

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210. Find λ if the lines $\frac{x}{6}=\frac{y}{2}=\frac{z}{-3}$ and $\frac{x}{p}=\frac{y}{-6}=\frac{z}{2}$ are at right angles.

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211. Find the intercepts of the plane 2x-3y+4z-24=0 on the cooridnate axes.

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212. Find the distance of the plane $x+y+z-\sqrt{3}=0$ from the origin.

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213. Does the line x=y=0 lie in the plane z=0.

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214. Name the surface represented by the equation $2x-3y=0$.

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215. Find the distance between the point (2,3,6) and (0,0,0).

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216. Write down the coordinates of the mid point of the segment joining the points A(1,-3,5) and B(-3,7,1).

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217. If the direction ratios of a line $<2,-1,-2>$ find the direction cosines of the line.

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218. find the vector equations of the line which is parallel to the vector $3\hat{i} - 2\hat{j} + 6\hat{k}$ and which is passes through the point (1,-2,3)

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

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220. If a line makes an angles of $30^\circ, 60^\circ, 90^\circ$ with the positive direction of x,y,z axis respectively, then find its direction cosines.

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221. If the x - coordinate of a point P on the line joining points Q(2,2,1) and R(5,1,-2) is 4, then its z-coordinate is

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222. Find the distance of the point whose position vector is $2\hat{i}+\hat{j}-\hat{k}$ from the plane $\vec{r}.\left(\hat{i}-2\hat{j}+4\hat{k}\right)=9.$

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223. Find the position vector of a point A in space such that $\overrightarrow{OA}$ is inclined at 60° to OX and at 45° to OY and $\left|\overrightarrow{OA}\right|=10units.$

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224. Parametric equations of a line are x=-1+2t, y=3-4t and z=2+t. find the equations of the line in the symmetrical form.

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225. Parametric equations a line are x=2-3t, y=-1+2t and z=3+t. write down the vector equations of the line.

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226. Vector equations of a line if $\vec{r} = 3\hat{i} - 6\hat{j} + 7\hat{k} + \lambda\left(2\hat{i} - \hat{j} + \hat{k}\right)$. Find te equations of the line in the symmetrical form.

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227. Vector equation of a plane is $\vec{r}.\left(2\hat{i} + 4\hat{j} - 3\hat{k}\right) = 5$. Write down the equation of the plane in the cartesian form.

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228. What is the distance of the point (-1,2,1) from the plane 2x-3y+4z+5=0.

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229. Find p if the plane x+y-2z+6=0 is parallel to the plane px+3y-6z-1=0.

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230. Write the equation to the locus of a point which is always at a fixed distance 'r' from the origin.

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231. Find the vector equations to the locus of a point whose distance from the point $C\left(\alpha\hat{i}+\beta\hat{j}+\gamma\hat{k}\right)$ is constant equal to a.

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232. If the line drawn from the point (-2,-1,-3) meets a plane at right angles at the point (1,-3,3), find the eqution of the plane.

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233. Write the distance of the plane 2x-y+2z+1=0 from the origin.

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234. Write the direction of cosines of the line joining the poidnts (1,0,0) and (0,0,1).

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235. Write the vector equations of the plane throught the point (a,b,c) and parallel to the plane $\vec{r}.\left(\hat{i}+\hat{j}+\hat{k}\right)=2$.

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236. If the cartesian equations of a line are : $\frac{3-x}{5}=\frac{y+4}{7}=\frac{2z-6}{4}$, write the vector equation for the line.

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237. Distance of the point (2,5,-3) from the plane $\vec{r} \cdot \left(6\hat{i} - 3\hat{j} + 2\hat{k}\right) = 4$ is

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238. Write down the direction cosines of the line whose equations are 5x-3=15y+7=3-10z.

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239. Write the sum of intercepts cut off by the plane $\vec{r} \cdot \left(2\hat{i} + \hat{j} - \hat{k}\right) - 5 = 0$ on the three axes.

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240. If a line angles $90^\circ, 135^\circ, 45^\circ$ with the positive x,y and z axis respectively, find its direction cosines.

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241. Find the direction cosines of a line which makes equal angles with the coordinate axes.

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242. If a line has the direction ratios –18, 12, – 4, then what are its direction cosines ?

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243. Show that the points (2, 3, 4), (– 1, – 2, 1), (5, 8, 7) are collinear.

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244. Find the direction cosines of the sides of the triangle whose vertices are (3, 5, – 4), (– 1, 1, 2) and (– 5, – 5, – 2).

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245. 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.

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246. 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).

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247. Show that the line through the points (4,7,8) and (2,3,4) is parallel to the vector $3\hat{i} + 2\hat{j} - 2\hat{k}$.

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248. 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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249. 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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250. Find the cartesian equation of the line which passes through the point (– 2, 4, – 5) and parallel to the line given by $\frac{x+3}{3} = \frac{y-4}{5} = \frac{z+8}{6}$

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

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

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253. Find the vector and the cartesian equations of the line that passes through the points (3, – 2, – 5), (3, – 2, 6).

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254. Find the angle between the following pair of lines: $\vec{r} = 2\hat{i} - 5\hat{j} + \hat{k} + \lambda\left(3\hat{i} + 2\hat{j} + 6\hat{k}\right)$ and $\vec{r} = 7\hat{i} - 6\hat{j} + \mu\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$

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255. Find the angle between the following pair of lines: $\vec{r} = 3\hat{i} + \hat{j} - 2\hat{k} + \lambda\left(\hat{i} - \hat{j} - 2\hat{k}\right)$ and $\vec{r} = 2\hat{i} - \hat{j} - 56\hat{k} + \mu\left(3\hat{i} - 5\hat{j} - 4\hat{k}\right)$

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256. Find the angle between the following pair of lines:

$$\frac{x-2}{2}=\frac{y-1}{5}=\frac{z+3}{-3} \text{ and } \frac{x+2}{-2}=\frac{y-4}{8}=\frac{z-5}{4}.$$

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257. Find the angle between the following pair of lines:

$$\frac{x}{2}=\frac{y}{2}=\frac{z}{1} \text{ and } \frac{x-5}{4}=\frac{y-2}{1}=\frac{z-3}{8}$$

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258. Find the value 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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259. 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

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

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261. Find the shortest distance between the lines $\left(\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}\right.$ and $\left.\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}\right)$

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262. Find the shortest distance between the 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 $\vec{r} = 4\hat{i} + 5\hat{j} + 6\hat{k} + \mu\left(2\hat{i} + 3\hat{j} + \hat{k}\right)$

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263. 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 $\vec{r} = (s+1)\hat{i} + (2s-1)\hat{j} - (2$

where t and s are scalars.

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

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265. Determine the direction cosines of the normal to the plane and the distance from the origin.

x+y+z=1

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

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

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

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269. Find the cartesian equation of the following planes.

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

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270. Find the cartesian equation of the following planes.

$\vec{r} \cdot \left(2\hat{i} + \hat{j} - 4\hat{k}\right) = 1.$

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271. Find the Cartesian equation of the following plane:

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

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

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273. In the following case, find the coordinates of the foot of the perpendicular drawn from the origin: $3y + 4z - 6 = 0$

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274. In the following cases, find the co-ordinates of the foot of the perpendicular drawn from the origin : $x + y + z = 1$

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

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

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277. 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 $\hat{i} - 2\hat{j} + \hat{k}$

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278. Find the equations of the plane that passes through three points : (1,1,-1), (6,4,-5), (-4,-2,3)

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279. Find the equations of the plane that passes through three points : (1,1,0), (1,2,1), (-2,2,-1)

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

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

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282. Find the equation of the plane throught he intersection of the planes : $3x - y + 2z - 4 = 0$ and $x + y + z - 2 = 0$ at the point (2,2,1).

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283. 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)

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284. Find the equation of the plane through the 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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285. Find the angle between the planes whose vector equations are $\vec{r} \cdot \left(2\hat{i} + 2\hat{j} - 3\hat{k}\right) = 5$ and $\vec{r} \cdot \left(3\hat{i} - 3\hat{j} + 5\hat{k}\right) = 3$

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286. In the following 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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287. In the following 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 $x - 2y + 5 = 0$

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288. In the following 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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289. Find the angle between them

2x-y+3z-1=0 and 2x-y+3z=0.

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290. 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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291. In the following exercises find the distances of each of the given points from the corresponding given plane.

	Point	Plane
(a)	(0, 0, 0)	$3x - 4y + 12z = 3$
(b)	(3, – 2, 1)	$2x - y + 2z + 3 = 0$
(c)	(2, 3, – 5)	$x + 2y - 2z = 9$
(d)	(– 6, 0, 0)	$2x - 3y + 6z - 2 = 0.$

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292. 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).

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293. 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 $m_1n_2 - m_2n_1, n_1l_2 - n_2l_1, l_1m_2 - l_2 - m_1$

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

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295. Find the equation of a line parallel to x-axis and passing through the origin.

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296. 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.

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

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

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299. Write the vector equations of the plane throught the point (a,b,c) and parallel to the plane $\vec{r}.\left(\hat{i} + \hat{j} + \hat{k}\right) = 2.$

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300. Find the shortest distance between the lines: $\vec{r} = 6\hat{i} + 2\hat{j} + 2\hat{k} + \lambda\left(\hat{i} - 2\hat{j} + 2\hat{k}\right)$ and $\vec{r} = -4\hat{i} - \hat{k} + \mu\left(3\hat{i} - 2\hat{j} -$

.

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301. Find the coordinates of the points where the line through (5,1,6) and (3,4,1) crosses YZ-plane.

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302. Find the coordinates of the point where the line through (5,1,6) and (3,4,1) crosses the ZX-plane.

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303. Find the coordinates of the point where the line through (3, – 4, – 5) and (2, – 3, 1) crosses the plane $2x + y + z = 7$

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304. Find the equation of the plane passing through the point (1,1,-1) and perpendicular to each of the planes :

$x + 2y + 3z - 7 = 0$ and $2x - 3y + 4z = 0$

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

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307. 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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308. Find the equation of the plane which contains the line of intersection of the planes $\vec{r} \cdot \left(\hat{i} + 2\hat{j} + 3\hat{k}\right) - 4 = 0$ and $\vec{r} \cdot \left(2\hat{i} + \hat{j} - \hat{k}\right) + 5 = 0$ and which is perpendicular to the plane $\vec{r} \cdot \left(5\hat{i} + 3\hat{j} - 6\hat{k}\right) + 8 = 0$

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309. 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 $\vec{r} . \left(\hat{i} - \hat{j} + \hat{k}\right)$=5.

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

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311. 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 $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$.

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

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

A. 2 units

B. 4units

C. 8 units

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

Answer:

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314. The planes $2x - y + 4z = 5$ and $5x - 2.5y + 10z = 6$ are :

A. perpendicular

B. parallel

C. intersect along y axis

D. passes through $\left(0, 0, \frac{5}{4}\right)$

Answer:

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315. If a line makes angle $90^\circ, 135^\circ, 45^\circ$ with X,Y and Z-axis respectively, then its direction cosines are

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316. The vector equation of the line through the points (3, 4, - 7) and (1, - 1,6) is .....

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317. Fill ups

Equations of a line containing the points (0,0,0) and (1,2,-3) are..... .

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318. If $\cos\alpha, \cos\beta, \cos\gamma$ are the direction-cosines of a line, then the value of $\sin^2\alpha + \sin^2\beta + \sin^2\gamma =$

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319. Fill ups

If the lines $\frac{x-1}{2}=\frac{y+2}{-3}=\frac{z-4}{\lambda}$ and $\frac{x}{1}=\frac{y}{-2}=\frac{z}{2}$ are t right angles then the value of λ is.....

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320. The vector equation of the line $\frac{x-5}{3}=\frac{y+4}{7}=\frac{z-6}{2}$ is .....

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321. Fill ups

The direction cosines of the vector $3\hat{i}+2\hat{j}-6\hat{k}$ are.....

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322. Direction cosines of $\hat{i}$ are '

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323. Fill ups

The equation of the plane containing the points (2,0,0),(0,3,0) and (0,0,4) is..... .

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324. Fill ups

A plane 'p' passes through the point P(1,-2,3). If O is the origin and $OP \perp p$, then equation of the plane p is..... .

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325. Find the cartesian equation of the following planes.

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

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326. If a line makes an angle of $\frac{\pi}{4}$ each of y and z axis, then the angle which it makes with x-axis is ..... .

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327. Fill ups

The equation of the plane containing the points (2,0,0),(0,3,0) and (0,0,4) is..... .

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328. Fill ups

Distance of the point (4,-2,3) from Y-axis is..... .

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329. Fill ups

Intercepts made by the plane 2x-3y+5z-30=0 on the coordinate axes are

respectively.

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330. The acute angle between the planes $\vec{r}.\left(2\hat{i}-3\hat{j}+\hat{k}\right)=1$ and $\vec{r}.\left(\hat{i}-2\hat{j}\right)=2$ is..... .

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331. Fill ups

The image of the poidnt (1,-2,3) in the plane x-2y+3z-14=0 is..... .

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332. Fill ups

The image of the poidnt (1,-2,3) in the plane x-2y+3z-14=0 is..... .

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333. True or false

The points (a,0,0),(0,b,0) and (0,0,c) are collinear $(abc \neq 0)$.

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334. The points (1, 2, 3), (-2, 3, 4) and (7,0,1) are collinear.

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335. The unit vector normal to the plane $x + 2y + 3z - 6 = 0$ is $\frac{1}{\sqrt{14}}\hat{i} + \frac{2}{\sqrt{14}}\hat{j} + \frac{3}{\sqrt{14}}\hat{k}$

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336. True or false

The line x=y=z lies in the plane x-2y+z-1=0.

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337. True or false

The line $\vec{r} = 2\hat{i} - 3\hat{j} + \hat{k} + t\left(\hat{i} - \hat{j} + 2\hat{k}\right)$ lies in the plane $\vec{r}.\left(3\hat{i} + \hat{j} - \hat{k}\right) - 2 = 0.$

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338. True or false

The projection of the point (α, β, γ) on the XOY plane is $(0, 0, \gamma)$

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339. The intercepts made by the plane $2x-3y+5z+4=0$ on the co-ordinate axis are $-2, \frac{4}{3}, -\frac{4}{5}$,

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340. True or false

The projection of the point (α, β, γ) on the z-axis $(0, 0, \gamma)$

Watch Video Solution

341. True or false

The vector equation of the line $\frac{x-5}{3}=\frac{y+4}{7}=\frac{z-6}{2}$ is

$\vec{r} = 5\hat{i} - 4\hat{j} + 6\hat{k} + \lambda\left(3\hat{i} + 7\hat{j} + 2\hat{k}\right)$.

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342. The acute angle between the planes $\vec{r}.\left(2\hat{i} - 3\hat{j} + \hat{k}\right) = 1$ and $\vec{r}.\left(\hat{i} - 2\hat{j}\right) = 2$ is..... .

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343. If $< l, m, n, >$ are D. cosines of a line then $l^2 + m^2 + n^2 =$

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344. The angle between the lines $\vec{r} = \left(5\hat{i} - \hat{j} - 4\hat{k}\right) + \lambda\left(2\hat{i} - \hat{j} + \hat{k}\right)$ and the plane $\vec{r}.\left(3\hat{i} - 4\hat{j} - \hat{k}\right) + 5 = 0$ is $\sin^{-1}\left(\frac{5}{2}\sqrt{91}\right)$.

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345. True or false

The distance of the point (-2,4,-5) from the line $\frac{x+3}{3}=\frac{y-4}{5}=\frac{z+8}{6}$ is $\sqrt{\frac{37}{10}}$.

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346. Find equation of a plane passing through the points $(2, 1, 0)$,(3,-2,-2) and (3,1,7)`

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347. The equation of a line, which is parallel to $2\hat{i}+\hat{j}+3\hat{k}$ and which passes through the point (5,-2,4) is $\frac{x-5}{2}=\frac{y+2}{-1}=\frac{z-4}{3}$

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348. True or false

If the foot of perpendicular drawn from the origin to a plane is (5,-3,-2) then the equation of the plane is $\vec{r}.\left(5\hat{i}-3\hat{j}-2\hat{k}\right)=38.$

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349. Direction cosines of x-axis are

A. lt1,0,0gt

B. lt0,1,0gt

C. lt0,0,1gt

D. lt0,1,1gt

Answer:

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350. Direction cosines of any normal to xy-plane are

A. (1,0,0)

B. (0,1,0)

C. (0,0,1)

D. (1,1,0)

Answer:

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351. Distance of the point (α, β, γ) from y-axis is

A. β

B. $|\beta|$

C. $|\alpha| + |\gamma|$

D. $\sqrt{a^2 - \gamma^2}$

Answer:

Watch Video Solution

352. The distance of a point P(a,b,c) from x axis is:

A. $\sqrt{a^2+c^2}$

B. $\sqrt{a^2+b^2}$

C. $\sqrt{b^2+c^2}$

D. b^2+c^2

Answer:

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353. If the direction cosine of a line are < k,k,k >, then,

A. kgt0

B. 0ltklt1

C. k=1

D. $k = \frac{1}{\sqrt{3}}$ or $-\frac{1}{\sqrt{3}}$

Answer:

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354. If a line makes angles α, β, γ respectively with positive directions of the coordinate axes, then the value of $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$.

A. 2

B. 1

C. 0

D. none of these

Answer:

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355. Distance of the point (α, β, γ) from y-axis is

A. γ

B. $|\gamma|$

C. sqrt(alpha^2+beta^2)`

D. none of these

Answer:

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356. The co-ordinates of foot of the perpendicular drawn from the point (2,5,7) on the x axis are given by:

A. (2,0,0)

B. (0,5,0)

C. (0,0,7)

D. (0,5,7)

Answer:

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357. The equation of x-axis is of the form

A. x=0, y=0

B. x=0, z=0

C. x=0

D. y=0,z=0

Answer:

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358. A set of D.R of the line

$\vec{r} = \left(\hat{i} + \hat{j} + \hat{k}\right) + 1\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right)$ are

A. $< 1, 1, 1 >$

B. $< 2, 3, 6 >$

C. $< 2\hat{i}, 3\hat{j}, 6\hat{k} >$

D. none of these

Answer:

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359. If α, β, γ are the angles that a line makes with the positive direction of x, y, z axis repectively, then the direction cosines of the line are:

A. $< \sin\alpha, \sin\beta, \sin\gamma >$

B. $< \cos\alpha, \cos\beta, \cos\gamma >$

C. $\tan\alpha, \tan\beta, \tan\gamma >$

D. $\cos^2\alpha, \cos^2\beta, \cos^2\gamma >$

Answer:

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360. P is a point on the line segment joining the points (3, 2, -1) and (6, 2,-2). If x co-ordinates of P is 5, then its y co-ordinate is

A. 2

B. 1

C. -1

D. -2

Answer:

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361. The shortest destance between $\vec{r} = \vec{a}_1 + \lambda \vec{b}$ and $\vec{r} = \vec{a}_2 + \mu \vec{b}$ is $\left| \frac{\vec{b} \times \left(\vec{a}_2 - \vec{a}_1 \right)}{\left| \vec{b} \right|} \right|$

A. $\frac{\left|\left(\vec{a}_2-\vec{a}_1\right).\left(\vec{b}_1\times\vec{b}_2\right)\right|}{\left|\vec{a}_1\times\vec{a}_2\right|}$

B. $\left(\left|\left(\vec{a}_2-\vec{a}_1\right).\left(\vec{b}_1\times\vec{b}_2\right)\right|\right)$

C. $\frac{\left|\left(\vec{a}_2-\vec{a}_1\right).\left(\vec{b}_1\times\vec{b}_2\right)\right|}{\left|\vec{b}_1\times\vec{b}_2\right|}$

D. none of these

Answer:

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362. The area of the quadrilateral ABCD, where A 0,4, 1), B (2, 3, -1), C (4, 5, 0) and D (2, 6, 2) is equal to

A. 9 square units

B. 18 square units

C. 27 square units

D. 81 square units.

Answer:

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363. The line x=1, y=2 is

A. parallel to X-axis

B. parallel to Y-axis

C. parallel to Z-axis

D. lies in a plane parallel to XY-plane.

Answer:

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364. The distance between the planes $3x + 2y - 6z = 14 = 0$ and $3x + 2y - 6z + 21 = 0$ is

A. 35

B. 7

C. 1

D. 5

Answer:

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365. The line $\frac{x-x_1}{0}=\frac{y-y_1}{1}=\frac{z-z_1}{2}$ is

A. at right angles to x-axis

B. at right angles to the plane YOZ

C. is parallel to Y-axis

D. none of these

Answer:

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366. The line $\frac{x-x_1}{0}=\frac{y-y_1}{1}=\frac{z-z_1}{2}$ is

A. parallel to X-axis

B. parallel to Y-axis

C. parallel to XOY-plane

D. parallel to Z-axis.

Answer:

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367. The locus represented by x y + yz=0 is

A. a pair of perpendicular lines

B. a pair of parallel lines

C. a pair of parallel planes

D. a pair of perpendicular planes

Answer:

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368. The line $\frac{x-x_1}{a}=\frac{y-y_1}{b}=\frac{z-z_1}{c}$ is at right angles to the plane $Ax+By+Cz+D=0$ if

A. $\frac{a}{A}=\frac{b}{B}=\frac{c}{C}$

B. $aA+bB+cC=0$

C. $a^2A^2+b^2B^2+c^2C^2=0$

D. aA+bB+cC=1.

Answer:

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369. The line $\frac{x-x_1}{a}=\frac{y-y_1}{b}=\frac{z-z_1}{c}$ is parallel to the plane Ax+By+Cz+D =0 if

A. $\frac{a}{A}=\frac{b}{B}=\frac{c}{C}$

B. aA+bB+cC=1

C. aA+bB+cC=0

D. none of these

Answer:

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370. The lines $\vec{r}=a_1+t\vec{v}_1$ and $\vec{r}=a_2+s\vec{v}_2$ lie in a plane $\left(\vec{v}_1\times\vec{v}_2\neq\vec{0}\right)$ iff

A. $\vec{a}_1\times\vec{a}_2=\vec{0}$

B. $\vec{a}_1\times\vec{v}_2=0$

C. $\vec{a}_2\times\vec{v}_1=0$

D. $\left(\vec{a}_2 - \vec{a}_1\right).\left(\vec{v}_1 \times \vec{v}_2\right) = 0$

Answer:

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371. If the projections of $\overrightarrow{PQ}$ on OX, OY and OZ are respectively 12,4,and 3 then |PQ| is equal to

A. 169

B. 19

C. 13

D. 144

Answer:

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372. The reflection of the point (α, β, γ) in the xy-plane is:

A. $(\alpha, \beta, 0)$

B. $(0, 0, \gamma)$

C. $(-\alpha, -\beta, \gamma)$

D. $(\alpha, \beta, -\gamma)$

Answer:

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373. The projection of the point (1,2,-4) in the YOZ-plane is

A. (0,2,-4)

B. (1,0,0)

C. (-1,2,-4)

D. (1,2,4)

Answer:

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