



MATHS

BOOKS - KC SINHA MATHS (HINGLISH)

3D - STRAIGHT LINES



3. Find the angle between the following pair of lines: A lines with direction ratios 2,2,1 A line joning (3,1,4)to (7,2,12)





A(3, 4, -7) and B(1, -1, 6). Find also, its Cartesian equations.



10. 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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11. find the vector equation of the line passing through the point A(2, -1, 1) and parallel to the ine joining the points B(-1, 4, 1) and C(1, 2, 2). Also find the Cartesian equation of the line.

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12. The Cartesian equation of a line are 3x + 1 = 6y - 2 = 1 - z. Find the direction ratios and write down its equation in vector form. 13. The Cartesian equations of a line are 6x - 2 = 3y + 1 = 2z - 2.

Find its direction ratios and also find a vector equation of the line.

14. Find the equation of the line passing through the point (-1, 2, 3)

and perpendicular to the lines $\frac{x}{2} = \frac{y-1}{-3} = \frac{z+2}{-2}$ and $\frac{x+3}{-1} = \frac{y+3}{2} = \frac{z-1}{3}$.

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15. Show that if the axes are rectangular the equation of line through

point
$$(x_1, y_1, z_1)$$
 at right angle to the lines
 $\frac{x}{l_1} = \frac{y}{m_1} = \frac{z}{n_1}, \frac{x}{l_2} = \frac{y}{m_2} = \frac{z}{n_2}$ is
 $\frac{x - x_1}{m_1 n_2 - m_2 n_1} = \frac{y - y_1}{n_1 l_2 - n_2 l_1} = \frac{z - z_1}{l_1 m_2 - l_2 m_1}$

16. Find coordinates of those points on the line $\frac{x-1}{2} = \frac{y+2}{3} = \frac{z+3}{6}$ which are at a distance of 3 units from points (1, -2, 3)

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17. Find the coordinartes of the point where the line through (3, 4, 1) and (5, 1, 6) crosses xy-plane

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18. Find the equation of the line drawn through point (1, 0, 2) to meet the

line
$$\frac{x+1}{3} = \frac{y-2}{-2} = \frac{z1}{-1}$$
 at right angles.



also the point of intersection of these 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

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22. Find the perpendicular distance of the point (1, 0, 0) from the lines x - 1 y + 1 z + 10

$$2 - -3 - -8$$

23. Find the coordinates of the foot of perpendicular from the point (2, 6, 3) to the line $\frac{x}{2} = \frac{y-1}{2} = \frac{z-2}{3}$. Also find the equation of this perpendicular.

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

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25. Find the image of the point (1, 6, 3) in the line $rac{x}{1} = rac{y-1}{2} = rac{z-2}{3}$

26. Find the shortest distance between the two lines whose vector equations given by: are $\overrightarrow{r}=\hat{i}+2\hat{j}+3\hat{k}+\lambda\Big(2\hat{i}+3\hat{j}+4\hat{k}\Big) ext{ and } \overrightarrow{r}=2\hat{i}+4\hat{j}+5\hat{k}+\mu\Big(3\hat{i}+4\hat{j}+4\hat{k}\Big)$ Watch Video Solution 27. Find the shortest distance and the vector equation of the line of shortest between lines given distance the by $\overrightarrow{r}=3\hat{i}+8\hat{j}+3\hat{k}+\lambdaig(3\hat{i}-\hat{j}+\hat{k}ig) ext{ and } \overrightarrow{r}=\ -3\hat{i}-7\hat{j}+6\hat{k}+\muig(-3\hat{k}+\hat{k}ig)$

28. Find the shortest distance between the two lines whose vector equations are given by: $\vec{r} = (3-t)\hat{i} + (4+2t)\hat{j} + (t-2)\hat{k}$ and $\vec{r} = (1+s)\hat{i} + (3s-7)\hat{j} + (2s-7)\hat{j}$

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29. Find the shortest distance between the two lines whose vector

equationsaregivenby:
$$\overrightarrow{r} = (1+\lambda)\hat{i} + (2-\lambda)\hat{j} + (-1+\lambda)\hat{k}$$
 and $\overrightarrow{r} = 2(1+\mu)\hat{i} - (1-\mu)\hat{j}$ \checkmark Watch Video Solution

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

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31. Determine whether the following pair of lines intersect:

$$\overrightarrow{r} = \hat{i} - \hat{j} + \lambda \Big(2 \hat{i} + \hat{k} \Big) \, \, ext{and} \, \, \overrightarrow{r} = 2 \hat{i} - \hat{j} + \mu \Big(\hat{i} + \hat{j} - \hat{k} \Big)$$



1. Find the angle between each of the following pair of line: $\vec{r} = 5\hat{i} - 7\hat{j} + \lambda \Big(-\hat{i} + 4\hat{j} + 2\hat{k} \Big) \vec{r} = -2\hat{i} + \hat{k} + \mu \Big(3\hat{i} + 3\hat{k} \Big)$

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2. Find the angle between each of the following pair of line: $\vec{r} = (2+s)\hat{i} + (s-1)\hat{j} + (2-3s)\hat{k}, \vec{r} = (1-t)\hat{i} + (2t+3)\hat{j} + \hat{k}$

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3. Find the angle between the following pairs of line: $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{6}, x+1 = \frac{y+2}{2} = \frac{z-3}{2}$

4. Find the angle between the following pairs of line:

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





7. Find the angle between the line:

$$\vec{r} = 4\hat{i} - \hat{j} + \lambda(\hat{i} + 2\hat{j} - 2\hat{k})$$
 and $vevr = \hat{i} - \hat{j} + 2\hat{k} - \mu(2\hat{i} + 4\hat{j} - 4\hat{k})$
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8. Show that line
$$\frac{x-3}{2} = \frac{y+1}{-3} = \frac{z-2}{4}$$
 is perpendicular to the line $\frac{x+2}{2} = \frac{y-4}{4} = \frac{z+5}{2}$

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9. 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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10. 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) and (4, 3, -1).

11.IfthecoordinatesofthepointsA, B, C, Dbe91, 2, 3), (4, 5, 7), (-4, 3, -6)and (2, 9, 2)respectivelythen find the angle between AB and CD.

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

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13.	Show	that	the	three	lines	with	direction	cosines
$\frac{12}{13},$	$-rac{3}{13},$	$-\frac{4}{13}$,	$\frac{4}{13}, -$	$\frac{12}{13}, \frac{3}{13}, $	$rac{3}{13}, \; -$	$\frac{4}{13}, \frac{12}{13}$	are	mutually
perpe	endicular							

14. Show that the line thorugh the points (4,7,8) and (2,3,4) $isparal \leq l \rightarrow thel \in ethrough thep \oint s(-1, -2, 1) and (1, 2, 5).$

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15. Show that the line thorugh the points (1,-1,2) and (3,4,-2) is perpendicular to the line through the points (0,3,2)andf (3,5,6).

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16. Show that the line
$$\frac{x-5}{7} = \frac{y=2}{-5} = \frac{z}{1}$$
 and $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ are

perpendicular to each other.

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17. Find the angle between the following pair of line: $\vec{r} = 3\hat{i} + \hat{j} - 2\hat{k} + \lambda(\hat{i} - \hat{j} - 2\hat{k})$ and $\vec{r} = 2\hat{i} - \hat{j} - 56\hat{k} + \mu(3\hat{i} - 5\hat{j})$ **18.** Find the angle between the following pair of line: $r = 2\hat{i} \equiv 5\hat{j} + \hat{k} + \lambda \left(3\hat{i} + 2\hat{j} + 6\hat{k}\right) \text{ and } \overrightarrow{r} = 7\hat{i} - 6\hat{k} + \mu \left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$

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19. Find the angle between the following pair of lines
$$\frac{x}{2} = \frac{y}{2} = \frac{z}{1}$$
 and $\frac{x-5}{4} = \frac{y^2}{1} = \frac{z-3}{8}$
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20. Find the angle between the following pair of lines: (i)

$$\frac{x-2}{2} = \frac{y-1}{5} = \frac{z+3}{-3} \text{ and } \qquad \frac{x+2}{-1} = \frac{y-4}{8} = \frac{z-5}{4} \text{ (ii)}$$

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



22. 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 $m_1n_2 - m_2n_1$, $n_1l_2 - n_2l_1$, $l_1m_2 - l_2m_1$.

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



24. Find the equation of the line passing through point $2\hat{i} - \hat{j} + 3\hat{k}$ and parallel to vector $\hat{i} + \hat{j} - 2\hat{k}$ in vector form as well as Cartesian form.

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25. Findthe equation of the line passing through points $\hat{i} - 2\hat{j} + \hat{k}$ and $-2\hat{j} + 3\hat{k}$ in vector form and Cartesian form.

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26. Find the euqation of the line passing through point (1,0,2) having direction ratios 3,-1,5. Prove that this line passes through (4,-1,7)



28. Find the vector equation of a line passing thorugh a point with position vector $2\hat{i} - 2\hat{j} + \hat{k}$ and parallel to the line joining the point with the position vectors $-\hat{i} + 3\hat{j} + \hat{k}$. Also find the Cartesian equation of this line.



29. A line passes through the point with position vector $2\hat{i} - \hat{j} + 3\hat{k}$ and is in the direction of $\hat{i} + \hat{j} - 2\hat{k}$. Find the equation of the line in vector and Cartesian forms.



30. Find the vector equation of a line parallel to the vector $2\hat{i} - \hat{j} + 2\hat{k}$ and passing through a point A with position vector $3\hat{i} + \hat{j} - \hat{k}$. **31.** Find the equation of the line (vector and Cartesian both) which is parallel to the vector $2\hat{i} - \hat{j} + 3\hat{k}$ and which passes through the point (5,-2,4)

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32. The Cartesian equation of a line is (x-5)/3=(y+4)/7=(z-6)/2. find the

vector equation of the line.

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33. Findthe vector equation of a straighat line which passes through the

points whose position vector are $\hat{i} - 2\hat{j}j + \hat{k}$ and $3\hat{k} - 2\hat{j}$.

34. Find the vector equation of the straighat line passing through the

point: (1,1,0) and (0,1,1)`



35. Find the vctor equation of the straighat line passing through the point: (-2,1,3) and (3,1,-2)`

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36. Find the equation of a line parallel to x axis and passing through the

origin.



37. Find the equation of the line which passes through the point (1, 2, 3)

and is parallel to the vector $3\hat{i}+2\hat{j}-2\hat{k}.$



38. The Cartesian equation of a line is (x-5)/3=(y+4)/7=(z-6)/2. Write its vector equation.

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39. Find the vector and Cartesiasn equation of the line that passes through the origin and (5,-2,3).

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



42. Find the equation of the line in Cartesiasn form that passes through the point with positoin 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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43. Find the point on the line $rac{x+2}{3}=rac{y+1}{2}=rac{z-3}{2}$ at a distance of

 $3\sqrt{2}$ from the point (1,2,3).

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

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45. Find the coordinates of the foot of perpendicular drawn from th point

A(1,8,4) to the line joining the points $B(0,\ -1,3) and C(2-3,\ -1)$.

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46. 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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47. 2/ Find the perpendicular distance of the point (1, 0, 0) from the line $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$ Also, and the coordinates of the foot of the perpendicular and the equation of the perpendicular.



49. Find the foot and hence the lengh of perpendicular form (5,7,3) to the

line $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$. Find also the equation of the

perpendicular.

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50. Find the equation of the perpendicular drawn from (2,4,-1) to the line

$$rac{x+5}{1} = rac{y+3}{4} = rac{z-6}{3}.$$

51. Find the length of the perpendicular from point (3,4,5) on the line

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

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52. Find the length and the foot of the perpendicular drawn from the

point
$$(2, -1, 5)$$
 to the line $rac{x-11}{10} = rac{y+2}{-4} = rac{x+8}{11}$

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53. Find the shortest distance between the following pair of line: $\vec{r} = \hat{i} + \hat{j} + \lambda \left(2\hat{i} - \hat{j} + 2\hat{k}\right), \vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu \left(3\hat{i} - 5\hat{j} + 2\hat{k}\right)$

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54. Find the shortest distance between the following pair of line: $\vec{r} = \hat{i} + 2\hat{j} + \hat{k} + \lambda(\hat{i} - \hat{j} + \hat{k}) \text{ and } \vec{r} = 2\hat{i} - \hat{j} - \hat{k} + \mu(2\hat{i} + \hat{j} + 2\hat{k})$

55. Find the shortest distance between the following pair of line: $\vec{r} = (1-t)\hat{i} + (t-2)\hat{j} + (3-2t)\hat{k}$ and $\vec{r} = (s+1)\hat{i} + (2s-1)\hat{j} - (2s-1)\hat{j}$



56. Find the shortest distance between the following pair of line: $\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - 3\hat{j} + 2\hat{k}) \text{ and } \vec{r} = 4\hat{i} + 5\hat{j} + 6\hat{k} + \mu(2\hat{i} + 3\hat{j})$

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57. Find the shortest distance between the following pair of line: $\vec{r} = \hat{i} + 2\hat{j} - 4\hat{k} + \lambda\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right) \text{ and } \vec{r} = 3\hat{i} + 3\hat{j} - 5\hat{k} + \mu\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right)$

58. Find the shortest distance between the following lines:

$$\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}; \frac{3-x}{-1} = \frac{y-5}{-2} = \frac{z-7}{1}$$
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59. Find the shortest distance between the lines
$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} and \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}.$$
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60. Find the shortest distance between the lines
$$\overrightarrow{r} = 3\hat{i} + 5\hat{j} + 7\hat{k} + \lambda(\hat{i} - 2\hat{j} + \hat{k}) ext{ and } \overrightarrow{r} = -\hat{i} + \hat{j} - \hat{k} + \mu(2\hat{i} - 6\hat{j})$$

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61. The angle between a line x = 1, y = 2 and y + 1 = 0, z = 0 is (A) 0^0

(B) 30^0 (C) 60^0 (D) 90^0



62. The line x = 1, y = 2 is (A) parallel to x-axis (B) parallel to y-axis (C)

parallel to z-axis (D) ies in a plane parallelto xy-plane.



65. The line $\frac{x - x_1}{0} = \frac{y - y_1}{1} = \frac{z - z_1}{2}$ is (A) parallel to x-axis (B) perpendicular to x-axis (C) perpendiculat to YOZ plane (D) parallel to y-axis

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66. The line
$$x = x_1, y = y_1$$
 is (A) parallel to x-axis (B) parallel to y-axis (C)
parallel to z-axis (D) parallel to XOY plane
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67. The equation of y-axis are (A) x=0, y=0 (B) x=0, z=0 (C)

y=0, z=0 (D) none of these

68. The equations of the line through the point $(alph, \beta, \gamma)$ and equally inclined to the axes are (A) $x - \alpha y - \beta = z - \gamma$ (B) $\frac{x-1}{\alpha} = \frac{y-1}{\beta} = \frac{z-1}{\gamma}$ (C) $\frac{x}{\alpha} = \frac{y}{\beta} = \frac{z}{\gamma}$ (D) none of these Watch Video Solution

69. The length of perpendicular from the poit (1, -1, 2) onthel $\in e \frac{x+1}{2} = \frac{2-y}{3} = \frac{z+2}{4}$ is (A) 0 (B) $\sqrt{6}$ (C) $\sqrt{21}$

(D) none of these

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70. The coordinates of the foot of perpendicular form the point A(1, 1, 1) on the lline joining ponts B(1, 4, 6) and C(5, 4, 4) are (A) (3,4,5) (B) (4,5,3) (C) (3,-4,5) (D) (-3,-4,5)

71. The direction atios of the line which is perpendicular to the lines $\frac{x-7}{2} = \frac{y+17}{-3} = z - 6 \text{ and } x + 5 = \frac{y+3}{2} = \frac{z-4}{-2} \text{ are (A) (4,5,7)}$ (B) (4,-5,7) (C) (4,-5,-7) (D) (-4,5,7)

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72. The line
$$\overrightarrow{r} = \alpha \left(\hat{i} + \hat{j} + \hat{k} \right) + 3\hat{k}$$
 and $\overrightarrow{r} = \beta \left(\hat{i} - 2\hat{j} + \hat{k} \right) + 3\hat{k}$
(A) intersect at rilghat angles (B) are skew (C) are parallel (D) none of these

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73. The distance of the point $A\left(\overrightarrow{a}\right)$ from the line $\overrightarrow{r} = \overrightarrow{b} + t\overrightarrow{c}$ is (A) $\left|\left(\overrightarrow{a} - \overrightarrow{b}\right) \times \overrightarrow{c}\right|$ (B) $\frac{\left|\left(\overrightarrow{a} - \overrightarrow{b}\right) \times \overrightarrow{c}\right|}{\left|\left(\overrightarrow{a} - \overrightarrow{b}\right)\right|}$ (C) $\frac{\left|\left(\overrightarrow{a} - \overrightarrow{b}\right) \times \overrightarrow{c}\right|}{\left|\overrightarrow{c}\right|}$ (D) $\frac{\left|\overrightarrow{a} \times \left(\overrightarrow{b} - \overrightarrow{c}\right)\right|}{\left|\overrightarrow{a}\right|}$

74. The length of perpendicular from the origin to the line $\vec{r} = \left(4\hat{i} = 2\hat{j} + 4\hat{k}\right) + \lambda\left(3\hat{i} + 4\hat{j} - 5\hat{k}\right)$ is (A) 2 (B) $2\sqrt{3}$ (C) `6 (D) 7

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76. The acute angle between the lines

$$\overrightarrow{r} = (4\hat{i} - \hat{j}) + 5(2\hat{i} + \hat{j} - 3\hat{k})$$
 and $\overrightarrow{r} = (\hat{i} - \hat{j} + 2\hat{k}) + t(\hat{i} - 3\hat{j} + 2\hat{k})$
is (A) $\frac{3\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{2\pi}{3}$ (D) $\frac{\pi}{6}$