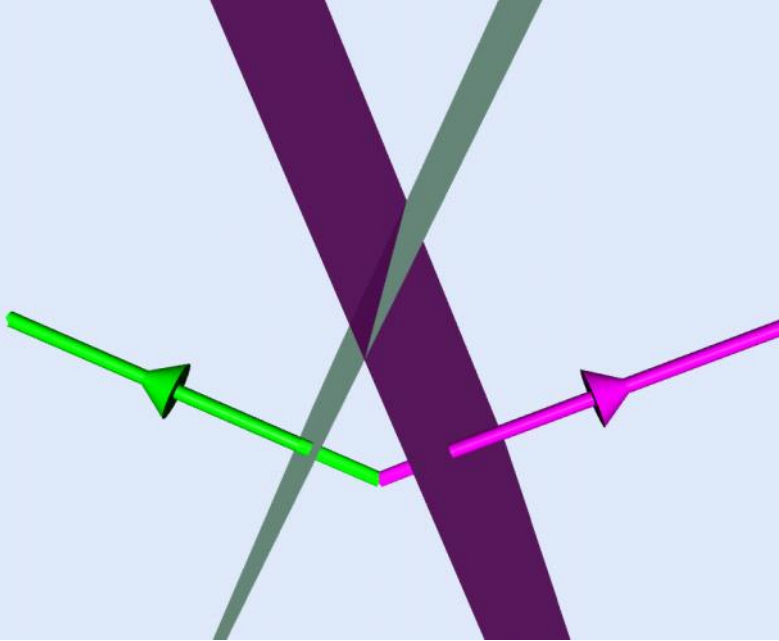(HL) ▦

Find the angle between the planes Π_1 and Π_2 to the nearest degree.

$\Pi_1 : 2x - 3y + z = 0$

$\Pi_2 : x + 2y + 5z = -4$

angle between two planes = angle between normals

$$\underline{n}_1 = \begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix} \qquad \underline{n}_2 = \begin{pmatrix} 1 \\ 2 \\ 5 \end{pmatrix}$$

$$|\underline{n}_1| = \sqrt{2^2 + (-3)^2 + 1^2} \qquad |\underline{n}_2| = \sqrt{1^2 + 2^2 + 5^2}$$

$$= \sqrt{4 + 9 + 1} \qquad\qquad = \sqrt{1 + 4 + 25}$$

$$= \sqrt{14} \qquad\qquad\quad = \sqrt{30}$$

$$\underline{n}_1 \bullet \underline{n}_2 = \begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix} \bullet \begin{pmatrix} 1 \\ 2 \\ 5 \end{pmatrix}$$

$$= 2 \cdot 1 + (-3) \cdot 2 + 1 \cdot 5$$

$$= 2 - 6 + 5$$

$$= 1$$

$$\cos \theta = \frac{1}{\sqrt{14} \sqrt{30}}$$

$$\theta \approx 87°$$

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□  Math Deg Norm1  d/c Real
cos⁻¹ ( 1 / (√14 √30) )
                    87.20314162
□

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