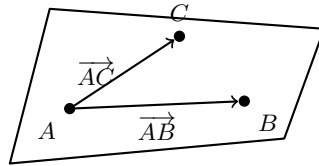


Question 2

Find an equation of the plane through $A = (1, 0, 2)$, $B = (3, -1, 4)$, and $C = (0, 2, 5)$. Determine whether the origin and $D = (2, 1, 3)$ lie on the same side of the plane.

Question 2 – Solution

Strategy Cross two independent displacement vectors to obtain a normal. Compare signs after substituting test points.



Plane Here $\overrightarrow{AB} = \langle 2, -1, 2 \rangle$ and $\overrightarrow{AC} = \langle -1, 2, 3 \rangle$, so $\overrightarrow{AB} \times \overrightarrow{AC} = \langle -7, -8, 3 \rangle$. Thus

$$\boxed{7x + 8y - 3z = 1}.$$

Side test Write $F(x, y, z) = 7x + 8y - 3z - 1$. Then $F(0, 0, 0) = -1$, while $F(2, 1, 3) = 12$. The signs differ, so the points lie on opposite sides.

Verification Each of A, B, C satisfies the plane equation.