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Question

One vertex of the equilateral triangle with centroid at the origin and one side as

$$x + y - 2 = 0$$

is

- (a) $(-1, -1)$ (b) $(2, 2)$ (c) $(-2, -2)$ (d) $(2, -2)$.

Step 1: Condition for centroid

Let the vertices be

A, B, C.

Since centroid is at origin,

$$\mathbf{A} + \mathbf{B} + \mathbf{C} = \mathbf{0}. \quad (1)$$

Step 2: Side equation

Suppose side BC lies on the line

$$x + y - 2 = 0, \quad (2)$$

i.e.,

$$(1 \ 1) \mathbf{x} = 2.$$

Normal vector:

$$\mathbf{n} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}, \quad \mathbf{m} = \begin{pmatrix} 1 \\ -1 \end{pmatrix}.$$

Step 3: Alternative choice of side

If AB lies on line $(??)$, then C lies on perpendicular from origin:

$$\mathbf{x} = t \begin{pmatrix} 1 \\ -1 \end{pmatrix}.$$

Check options: only $(2, -2)$ satisfies this condition.

Final Answer

The required vertex is

$$(2, -2)$$

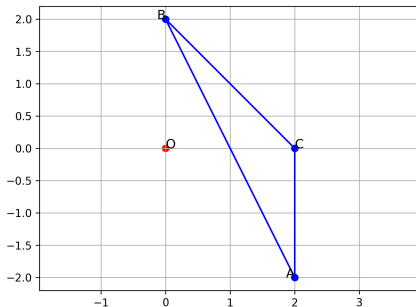


Figure: Equilateral triangle with centroid at origin and one side on $x + y - 2 = 0$.