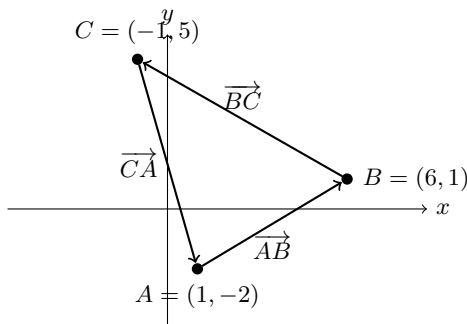


**Question 9**

A triangle has vertices  $A = (1, -2)$ ,  $B = (6, 1)$ , and  $C = (-1, 5)$ . Verify the closed-path identity  $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = \vec{0}$ .

## Question 9 – Solution

**Strategy** Write every vector in matching component order. Perform scalar multiplication before addition or subtraction, then interpret the resulting components in the context of the problem.



**Step 1** Compute  $\vec{AB} = \langle 5, 3 \rangle$ ,  $\vec{BC} = \langle -7, 4 \rangle$ , and  $\vec{CA} = \langle 2, -7 \rangle$ .

**Step 2** Add the three:  $\langle 5 - 7 + 2, 3 + 4 - 7 \rangle = \langle 0, 0 \rangle$ .

**Step 3** Therefore  $\boxed{\vec{AB} + \vec{BC} + \vec{CA} = \vec{0}}$ , as any closed displacement path must.

**Verification** The result follows from the defining vector formulas used above, and each component, magnitude, or scalar condition has been checked against the information in the question.

**Key idea** Vector equations behave like ordinary algebra provided that every operation is performed component by component. A final component check is often the fastest verification.