Mathematics 3
Vector

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Question

1. if $z_1 = 5i - 2j, z_2 = 3i + 3j, z_3 = 4i - 1j$, determine

   a) $z_1 + z_2 + z_3$

   b) $z_1 - z_2 - z_3$

2. if $\overline{OA} = 4i + 3j, \overline{OB} = 6i - 2j, \overline{OC} = 2i - j$, determine $\overline{AB}, \overline{BC}, \overline{CA}$ and determine the lengths of the sides of triangle **ABC.**

3. Determine the result of adding this vector along with its image

   a) $\overline{PQ} + \overline{QR} + \overline{RS} + \overline{ST} = \ldots$

   b) $\overline{AC} + \overline{CL} - \overline{ML} = \ldots$

   c) $\overline{GH} + \overline{HJ} + \overline{JK} + \overline{KL} + \overline{LG} = \ldots$

   d) $\overline{AB} + \overline{BC} + \overline{CD} + \overline{DB} = \ldots$

Answer

1. -

   a) -

$$\begin{aligned} z_1 + z_2 + z_3 &= (5i - 2j) + (3i + 3j) + (4i - 1j) \\ &= 5i + 3i + 4i - 2j + 3j - 1j \\ &= 12i + 0j \end{aligned}$$

   b) -

$$\begin{aligned} z_1 - z_2 - z_3 &= (5i - 2j) - (3i + 3j) - (4i - 1j) \\ &= 5i - 3i - 4i - 2j - 3j + 1j \\ &= -2i - 4j \end{aligned}$$

2. -

$$\begin{aligned}
\overline{AB} &= \overline{OB} - \overline{OA} \\
&= (6i - 2j) - (4i + 3j) \\
&= 2i - 5j \\
\left|\overline{AB}\right| &= \sqrt{(2)^2 + (-5)^2} \\
&= \sqrt{4 + 25} = \sqrt{29} \\
\overline{BC} &= \overline{OC} - \overline{OB} \\
&= (2i - j) - (6i - 2j) \\
&= -4i + j \\
\left|\overline{BC}\right| &= \sqrt{(-4)^2 + (1)^2} \\
&= \sqrt{16 + 1} = \sqrt{17} \\
\overline{CA} &= \overline{OA} - \overline{OC} \\
&= (4i + 3j) - (2i - j) \\
&= 2i + 4j \\
\left|\overline{CA}\right| &= \sqrt{(2)^2 + (4)^2} \\
&= \sqrt{4 + 16} = \sqrt{20} \\
\mathbf{ABC} &= \left|\overline{AB}\right| + \left|\overline{BC}\right| + \left|\overline{CA}\right| \\
&= \sqrt{29} + \sqrt{17} + \sqrt{20}
\end{aligned}$$

3. -

a) $\overline{PT}$

b) $\overline{AC} + \overline{CL} + \overline{LM} - \overline{ML} = \overline{AL}$

c) 0

d) $\overline{AB}$