

Presentation - Matgeo

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Problem Statement

Find the distance between the points $(0, 5)$ and $B(-5, 0)$.

Description of Variables used

represent points as **A** and **B**

Input variable	Value
A	$\begin{pmatrix} 0 \\ 5 \end{pmatrix}$
B	$\begin{pmatrix} -5 \\ 0 \end{pmatrix}$

Table

Theoretical Solution

Represent the points as vectors:

$$\mathbf{A} = \begin{pmatrix} 0 \\ 5 \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} -5 \\ 0 \end{pmatrix} \quad (2.1)$$

The distance between \mathbf{A} and \mathbf{B} is

$$d(\mathbf{A}, \mathbf{B}) = \|\mathbf{B} - \mathbf{A}\| \quad (2.2)$$

Subtracting the vectors,

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 0 \\ 5 \end{pmatrix} - \begin{pmatrix} -5 \\ 0 \end{pmatrix} = \begin{pmatrix} 5 \\ 5 \end{pmatrix} \quad (2.3)$$

Now, compute the Euclidean norm:

$$d(\mathbf{A}, \mathbf{B}) = \sqrt{(\mathbf{B} - \mathbf{A})^T (\mathbf{B} - \mathbf{A})} \quad (2.4)$$

Theoretical Solution

$$d(\mathbf{A}, \mathbf{B}) = \sqrt{(5 \ 5) \begin{pmatrix} 5 \\ 5 \end{pmatrix}} = \sqrt{50} \quad (2.5)$$

$$d(\mathbf{A}, \mathbf{B}) = 5\sqrt{2} \quad (2.6)$$

Final Answer:

$$d(\mathbf{A}, \mathbf{B}) = \|\mathbf{B} - \mathbf{A}\| = 5\sqrt{2} \quad (2.7)$$

Plot

