

**Problem 1.8.8.** Find the distance between the points  $A(0, 6)$  and  $B(0, -2)$ .

**Solution.**

Input variable	Value
A	$\begin{pmatrix} 0 \\ 6 \end{pmatrix}$
B	$\begin{pmatrix} 0 \\ -2 \end{pmatrix}$

Table 1

Represent the points as vectors:

$$\mathbf{A} = \begin{pmatrix} 0 \\ 6 \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} 0 \\ -2 \end{pmatrix} \quad (1)$$

The distance between A and B is

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

Subtracting the vectors,

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 0 \\ -2 \end{pmatrix} - \begin{pmatrix} 0 \\ 6 \end{pmatrix} = \begin{pmatrix} 0 \\ -8 \end{pmatrix} \quad (3)$$

Now, compute the Euclidean norm:

$$d(\mathbf{A}, \mathbf{B}) = \sqrt{(\mathbf{B} - \mathbf{A})^T (\mathbf{B} - \mathbf{A})} \quad (4)$$

$$d(\mathbf{A}, \mathbf{B}) = \sqrt{(0 \quad -8) \begin{pmatrix} 0 \\ -8 \end{pmatrix}} = \sqrt{64} \quad (5)$$

$$d(\mathbf{A}, \mathbf{B}) = 8 \quad (6)$$

**Final Answer:**

$$d(\mathbf{A}, \mathbf{B}) = \|\mathbf{B} - \mathbf{A}\| = 8 \tag{7}$$

Distance  $\|\mathbf{B} - \mathbf{A}\| = 8.00$

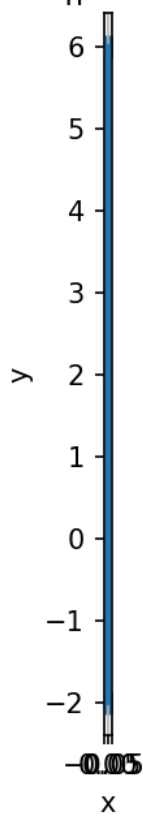


Figure 1