1-1.8-2

EE24BTECH11005 - Arjun Pavanje

Question:
Find the distance between the following pairs of points

1) $\begin{pmatrix}2\\3\\5\end{pmatrix}$ and $\begin{pmatrix}4\\3\\1\end{pmatrix}$

2) $\begin{pmatrix}-3\\7\\2\end{pmatrix}$ and $\begin{pmatrix}2\\4\\-1\end{pmatrix}$

3) $\begin{pmatrix}-1\\3\\-4\end{pmatrix}$ and $\begin{pmatrix}1\\-3\\4\end{pmatrix}$

4) $\begin{pmatrix}2\\-1\\3\end{pmatrix}$ and $\begin{pmatrix}-2\\1\\3\end{pmatrix}$

Variable	Description
$\mathbf{a_1}$	$\begin{pmatrix}2\\3\\5\end{pmatrix}$ point
$\mathbf{a_2}$	$\begin{pmatrix}4\\3\\1\end{pmatrix}$ point
$\mathbf{b_1}$	$\begin{pmatrix}-3\\7\\2\end{pmatrix}$ point
$\mathbf{b_2}$	$\begin{pmatrix}2\\4\\-1\end{pmatrix}$ point
$\mathbf{c_1}$	$\begin{pmatrix}-1\\3\\-4\end{pmatrix}$ point
$\mathbf{c_2}$	$\begin{pmatrix}1\\-3\\4\end{pmatrix}$ point
$\mathbf{d_1}$	$\begin{pmatrix}2\\-1\\3\end{pmatrix}$ point
$\mathbf{d_2}$	$\begin{pmatrix}-2\\1\\3\end{pmatrix}$ point

TABLE I: Variables Used

Solution:

1)

$$a_2 - a_1 = \begin{pmatrix} 2 \\ 0 \\ -4 \end{pmatrix} \tag{1}$$

$$\|a_2 - a_1\| = \sqrt{(a_2 - a_1)^T (a_2 - a_1)} = \sqrt{20} \tag{2}$$

Distance $= \sqrt{20}$

2)

$$b_2 - b_1 = \begin{pmatrix} 5 \\ -3 \\ -3 \end{pmatrix} \tag{3}$$

$$\|b_2 - b_1\| = \sqrt{(b_2 - b_1)^T (b_2 - b_1)} = \sqrt{43} \tag{4}$$

Distance $= \sqrt{43}$

3)

$$c_2 - c_1 = \begin{pmatrix} 2 \\ -6 \\ 8 \end{pmatrix} \tag{5}$$

$$\|c_2 - c_1\| = \sqrt{(c_2 - c_1)^T (c_2 - c_1)} = \sqrt{104} \tag{6}$$

Distance $= \sqrt{104}$

4)

$$d_2 - d_1 = \begin{pmatrix} -4 \\ 2 \\ 0 \end{pmatrix} \tag{7}$$

$$\|d_2 - d_1\| = \sqrt{(d_2 - d_1)^T (d_2 - d_1)} = \sqrt{20} \tag{8}$$

Distance $= \sqrt{20}$

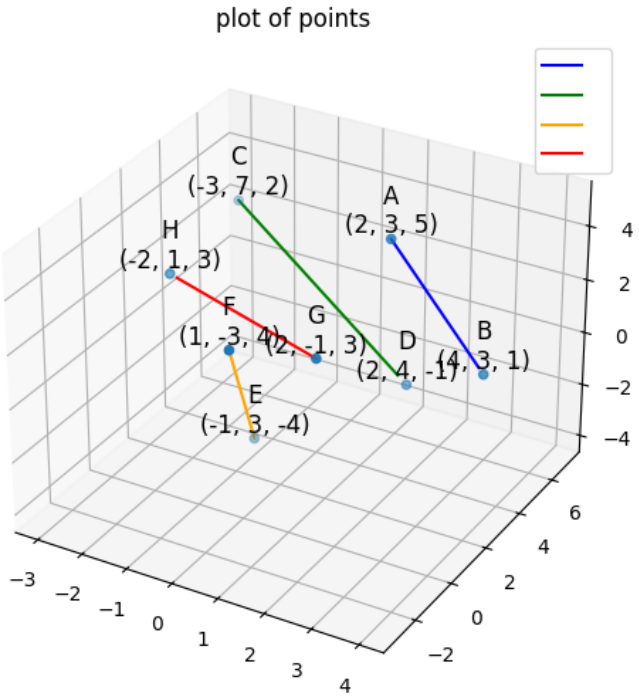

Fig. 1: Plot of the points