

Vector Properties

G V V Sharma*

CONTENTS

1	Direction Vector	1
2	Norm	1

Abstract—This book provides a computational approach to school geometry based on the NCERT textbooks from Class 6-12. Links to sample Python codes are available in the text.

1 DIRECTION VECTOR

1.1. Find the direction vectors of the sides of a triangle with vertices $\mathbf{A} = \begin{pmatrix} 3 \\ 5 \\ -4 \end{pmatrix}$, $\mathbf{B} =$

$$\begin{pmatrix} -1 \\ 1 \\ 2 \end{pmatrix}, \text{ and } \mathbf{C} = \begin{pmatrix} -5 \\ -5 \\ -2 \end{pmatrix}$$

Solution:

1.2. Find a unit vector in the direction of

$$\begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix}. \quad (1.2.1)$$

Solution:

1.3. Find a unit vector in the direction of $\begin{pmatrix} 2 \\ -1 \\ -2 \end{pmatrix}$.

Solution:

1.4. Find a unit vector in the direction of the line passing through $\begin{pmatrix} -2 \\ 4 \\ -5 \end{pmatrix}$ and $\begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$.

Solution:

2 NORM

2.1. Find a point on the y -axis which is equidistant from the points $\mathbf{A} = \begin{pmatrix} 6 \\ 5 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$.

Solution:

2.2. Find the equation of set of points \mathbf{P} such that

$$PA^2 + PB^2 = 2k^2, \quad (2.2.1)$$

$$\mathbf{A} = \begin{pmatrix} 3 \\ 4 \\ 5 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} -1 \\ 3 \\ -7 \end{pmatrix}, \quad (2.2.2)$$

respectively. **Solution:**

2.3. Find the equation of the set of points \mathbf{P} such that its distances from the points $\mathbf{A} = \begin{pmatrix} 3 \\ 4 \\ -5 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} -2 \\ 1 \\ 4 \end{pmatrix}$ are equal.

Solution:

*The author is with the Department of Electrical Engineering, Indian Institute of Technology, Hyderabad 502285 India e-mail: gadepall@iith.ac.in. All content in this manual is released under GNU GPL. Free and open source.