

Matrix Theory (EE5609) Assignment 1

Utkarsh Shashikant Surwade

Abstract—This document contains the solution to find a unit vector perpendicular to two vectors

Download all python codes from

[https://github.com/utkarshsurwade/
Matrix_Theory_EE5609/tree/master/codes](https://github.com/utkarshsurwade/Matrix_Theory_EE5609/tree/master/codes)

and latex-tikz codes from

[https://github.com/utkarshsurwade/
Matrix_Theory_EE5609/tree/master/
Assignment1](https://github.com/utkarshsurwade/Matrix_Theory_EE5609/tree/master/Assignment1)

$$\|C\| = \sqrt{16^2 + (-16)^2 - 8^2} = 24 \quad (2.0.6)$$

Let u be the unit vector of C which can be found as follows:

$$u = \frac{C}{\|C\|} \quad (2.0.7)$$

Solving the above equation gives the unit vector u which is perpendicular to vectors A and B

$$u = \frac{1}{3} \begin{pmatrix} 2 \\ -2 \\ 1 \end{pmatrix} \quad (2.0.8)$$

1 PROBLEM

Find a unit vector perpendicular to each of the vectors $a+b$ and $a-b$, where

$$a = \begin{pmatrix} 3 \\ 2 \\ 2 \end{pmatrix}, b = \begin{pmatrix} 1 \\ 2 \\ -2 \end{pmatrix} \quad (1.0.1)$$

2 SOLUTION

Let $A = a+b$ and $B = a-b$

$$A = \begin{pmatrix} 3 \\ 2 \\ 2 \end{pmatrix} + \begin{pmatrix} 1 \\ 2 \\ -2 \end{pmatrix} = \begin{pmatrix} 4 \\ 4 \\ 0 \end{pmatrix} \quad (2.0.1)$$

$$B = \begin{pmatrix} 3 \\ 2 \\ 2 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \\ -2 \end{pmatrix} = \begin{pmatrix} 2 \\ 0 \\ 4 \end{pmatrix} \quad (2.0.2)$$

Let C be a vector Perpendicular to A and B which can be found by the cross product of A and B

$$C = A \times B \quad (2.0.3)$$

$$C = \begin{vmatrix} i & j & k \\ 4 & 4 & 0 \\ 2 & 0 & 4 \end{vmatrix} \quad (2.0.4)$$

$$\therefore C = \begin{pmatrix} 16 \\ -16 \\ -8 \end{pmatrix} \quad (2.0.5)$$