Assignment 1

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***Abstract*—This document illustrates scalar and vector products of two vectors**

Download python code from :

https://github.com/shreeprasadbhat/matrix−theory/tree/master/assignment1/codes

Problem

Find scalar and vector products of the two vectors

$$a = \begin{bmatrix} 3 \\ -4 \\ 5 \end{bmatrix}, b = \begin{bmatrix} -2 \\ 1 \\ -3 \end{bmatrix}$$

Solution :

Scalar product :

$$a \,.\, b \;=\; a \times b^T$$

$$= \begin{bmatrix} 3 \\ -4 \\ 5 \end{bmatrix} \times \begin{bmatrix} -2 & 1 & -3 \end{bmatrix}$$

$$= (3 \times -2) \;+\; (-4 \times 1) \;+\; (5 \times -3)$$

$$= -25$$

Cross product :

$$a \;\times\; b \;=\; \begin{bmatrix} 3 \\ -4 \\ 5 \end{bmatrix} \;\times\; \begin{bmatrix} -2 \\ 1 \\ -3 \end{bmatrix} \;=\; \begin{vmatrix} i & j & k \\ 3 & -4 & 5 \\ -2 & 1 & -3 \end{vmatrix}$$

$$= ((-4\times-3) - (1\times5)) * i - ((3\times3) - (-2\times5)) * j + ((3\times1) - (-2\times-4)) * k$$

$$= 7i \;-\; j \;-\; 5k$$

$$= \begin{bmatrix} 7 \\ -1 \\ -5 \end{bmatrix}$$