

ASSIGNMENT 1
AI20MTECH11003
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Question

Find the cross product of a and b.

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

$$b = \begin{bmatrix} 3 \\ -2 \\ 2 \end{bmatrix}$$

SOLUTION =

Cross Product of two vectors = $a \text{ cross } b$

$$= \begin{bmatrix} a_2b_3 - a_3b_2 \\ a_1b_3 - a_3b_1 \\ a_1b_2 - a_2b_1 \end{bmatrix}$$

$$= \begin{bmatrix} (-7 * 2) - (7 * -2) \\ (1 * 2) - (7 * 3) \\ (1 * -2) - (-7 * 3) \end{bmatrix}$$

$$= \begin{bmatrix} 0 \\ 19 \\ 19 \end{bmatrix}$$

Another method to determine cross product is by spanning a vector into skew symmetric matrix-

$a \text{ cross } b$

$$= \begin{bmatrix} 0 & -a_3 & a_2 \\ a_3 & 0 & -a_1 \\ -a_2 & a_1 & 0 \end{bmatrix} \begin{bmatrix} 3 \\ -2 \\ 2 \end{bmatrix}$$

$$\begin{aligned}
&= \begin{bmatrix} 0 & -7 & -7 \\ 7 & 0 & -1 \\ 7 & 1 & 0 \end{bmatrix} \begin{bmatrix} 3 \\ -2 \\ 2 \end{bmatrix} \\
&= \begin{bmatrix} 0 \\ 19 \\ 19 \end{bmatrix}
\end{aligned}$$