Vectors Assignment-1

Section12thMath- Excercise 12.10.4.1

1. Find $|\mathbf{a} \times \mathbf{b}|\,, if \mathbf{a} = \hat{i} - 7\hat{j} + 7\hat{k}$ and $\mathbf{b} = 3\hat{i} - 2\hat{j} + 2\hat{k}$

Solution: The cross product of vectors $\mathbf{a}$ and $\mathbf{b}$ is given as:

$$
\begin{aligned}
|\mathbf{a} \times \mathbf{b}| &= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -7 & 7 \\ 3 & -2 & 2 \end{vmatrix} && (1)\\
&= \hat{i}(-14 + 14) + \hat{j}(2 - 21) + \hat{k}(-2 + 21) && (2)\\
&= 0\hat{i} - 19\hat{j} + 19\hat{k} && (3)\\
&= |\mathbf{a} \times \mathbf{b}| = \sqrt{19^2 + 19^2} && (4)\\
&= \sqrt{2} \times 19 && (5)\\
&= 19\sqrt{2} && (6)
\end{aligned}
$$