

Exercise 3

Compute $\mathbf{a} \times \mathbf{b}$, where $\mathbf{a} = \mathbf{i} - 2\mathbf{j} + \mathbf{k}$, $\mathbf{b} = 2\mathbf{i} + \mathbf{j} + \mathbf{k}$.

Solution

$$\begin{aligned}\mathbf{a} \times \mathbf{b} &= \begin{vmatrix} \hat{\mathbf{x}} & \hat{\mathbf{y}} & \hat{\mathbf{z}} \\ 1 & -2 & 1 \\ 2 & 1 & 1 \end{vmatrix} \\ &= \begin{vmatrix} -2 & 1 \\ 1 & 1 \end{vmatrix} \hat{\mathbf{x}} - \begin{vmatrix} 1 & 1 \\ 2 & 1 \end{vmatrix} \hat{\mathbf{y}} + \begin{vmatrix} 1 & -2 \\ 2 & 1 \end{vmatrix} \hat{\mathbf{z}} \\ &= [(-2)(1) - (1)(1)]\hat{\mathbf{x}} - [(1)(1) - (1)(2)]\hat{\mathbf{y}} + [(1)(1) - (-2)(2)]\hat{\mathbf{z}} \\ &= -3\hat{\mathbf{x}} + \hat{\mathbf{y}} + 5\hat{\mathbf{z}} \\ &= (-3, 1, 5)\end{aligned}$$