

Tutorial for Chapter 2

64. Find the projection of the vector $4\mathbf{i} - 3\mathbf{j} + \mathbf{k}$ on the line passing through the points $(2, 3, -1)$ and $(-2, -4, 3)$.

65. If $\mathbf{A} = 4\mathbf{i} - \mathbf{j} + 3\mathbf{k}$ and $\mathbf{B} = -2\mathbf{i} + \mathbf{j} - 2\mathbf{k}$, find a unit vector perpendicular to both \mathbf{A} and \mathbf{B} .

80. If $\mathbf{A} = \mathbf{i} - 2\mathbf{j} - 3\mathbf{k}$, $\mathbf{B} = 2\mathbf{i} + \mathbf{j} - \mathbf{k}$ and $\mathbf{C} = \mathbf{i} + 3\mathbf{j} - 2\mathbf{k}$, find:

| | | |
|--|---|--|
| (a) $ (\mathbf{A} \times \mathbf{B}) \times \mathbf{C} $, | (c) $\mathbf{A} \cdot (\mathbf{B} \times \mathbf{C})$, | (e) $(\mathbf{A} \times \mathbf{B}) \times (\mathbf{B} \times \mathbf{C})$ |
| (b) $ \mathbf{A} \times (\mathbf{B} \times \mathbf{C}) $, | (d) $(\mathbf{A} \times \mathbf{B}) \cdot \mathbf{C}$, | (f) $(\mathbf{A} \times \mathbf{B})(\mathbf{B} \cdot \mathbf{C})$ |

83. Find the area of a triangle with vertices at $(3, -1, 2)$, $(1, -1, -3)$ and $(4, -3, 1)$.

88. Simplify $(\mathbf{A} + \mathbf{B}) \cdot (\mathbf{B} + \mathbf{C}) \times (\mathbf{C} + \mathbf{A})$.

95. Let points P, Q and R have position vectors $\mathbf{r}_1 = 3\mathbf{i} - 2\mathbf{j} - \mathbf{k}$, $\mathbf{r}_2 = \mathbf{i} + 3\mathbf{j} + 4\mathbf{k}$ and $\mathbf{r}_3 = 2\mathbf{i} + \mathbf{j} - 2\mathbf{k}$ relative to an origin O . Find the distance from P to the plane OQR .

100. Prove that $(\mathbf{A} \times \mathbf{B}) \cdot (\mathbf{C} \times \mathbf{D}) + (\mathbf{B} \times \mathbf{C}) \cdot (\mathbf{A} \times \mathbf{D}) + (\mathbf{C} \times \mathbf{A}) \cdot (\mathbf{B} \times \mathbf{D}) = 0$.