Exercise 1

Show that the vectors $\vec{A} = 3\hat{i} - 5\hat{j} + 2\hat{k}$ and $\vec{B} = 2\hat{i} + 4\hat{j} + 7\hat{k}$ are orthogonal.

Exercise 2

Find a unit vector which is perpendicular to the plane containing the vectors $2\hat{i} - \hat{j} - \hat{k}$ and $\hat{i} + 2\hat{j} + \hat{k}$

[Ans. $\left(1/\sqrt{35}\right)(\hat{i} - 3\hat{j} + 5\hat{k})$]

Exercise 3

Vector $\vec{A} = 3\hat{i} - 5\hat{j} + 2\hat{k}$ and $\vec{B} = 6\hat{i} + \alpha\hat{j} + \beta\hat{k}$. Find the values of $\alpha$ and $\beta$ such that the vectors are parallel

[Ans. $\alpha = -10, \beta = 4$]

Exercise 4

Prove the following vector identity which is very useful and often used

$$\vec{A} \times (\vec{B} \times \vec{C}) = \vec{B}(\vec{A} \cdot \vec{C}) - \vec{C}(\vec{A} \cdot \vec{C})$$

For ease of remembering this formula is often known as bac-cab formula.
Exercise 5

Show that the cross product of vectors satisfy the transformation property stated above.