PH1101 ASSIGNMENT-1

Q1. $\vec{A} = 3\hat{i} + 4\hat{j} - 5\hat{k}$; $\vec{B} = -\hat{i} + 2\hat{j} + 6\hat{k}$

$$\boxed{\vec{A} + \vec{B} = 2\hat{i} + 6\hat{j} + \hat{k}}$$

Q2. $\vec{A} = 3\hat{i} + 4\hat{j} - 5\hat{k}$; $\vec{B} = -\hat{i} + 2\hat{j} + 6\hat{k}$

$$\Rightarrow \vec{A} \cdot \vec{B} = (-3) + (8) + (-30) = 8 - 33 = \boxed{-25}$$

Q3. $\vec{A} = 3\hat{i} + 4\hat{j} - 5\hat{k}$; $\vec{B} = -\hat{i} + 2\hat{j} + 6\hat{k}$

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 4 & -5 \\ -1 & 2 & 6 \end{vmatrix} = \hat{i}(24 + 10) - \hat{j}(18 - 5) + \hat{k}(6 + 4)$$

$$\boxed{\vec{A} \times \vec{B} = 34\hat{i} - 13\hat{j} + 10\hat{k}}$$

Q4. $\vec{A} = 3\hat{i} + 4\hat{j} - 5\hat{k} \Rightarrow \hat{A} = \dfrac{\vec{A}}{|\vec{A}|}$

$$|\vec{A}| = \sqrt{9 + 16 + 25} = \sqrt{50} = \sqrt{25 \times 2} = 5\sqrt{2}$$

$$\Rightarrow \boxed{\hat{A} = \frac{1}{5\sqrt{2}}(3\hat{i} + 4\hat{j} - 5\hat{k})}$$

$$\vec{B} = -\hat{i} + 2\hat{j} + 6\hat{k} \Rightarrow \hat{B} = \frac{\vec{B}}{|\vec{B}|}$$

$$|\vec{B}| = \sqrt{1 + 4 + 36} = \sqrt{41} \Rightarrow \boxed{\hat{B} = \frac{1}{\sqrt{41}}(-\hat{i} + 2\hat{j} + 6\hat{k})}$$

Q5. $\vec{A} = 3\hat{i} + 4\hat{j} - 5\hat{k}$; $\vec{B} = -\hat{i} + 2\hat{j} + 6\hat{k}$

$\vec{A} - \vec{B} = 4\hat{i} + 2\hat{j} + \hat{k}$

$\vec{B} - \vec{A} = -4\hat{i} - 2\hat{j} + 11\hat{k}$

Q6. $\vec{A} \cdot (\vec{A} \times \vec{B})$

$\vec{A} \times \vec{B} = 34\hat{i} - 13\hat{j} + 10\hat{k}$ (From Q.3)

$\vec{A} \cdot (\vec{A} \times \vec{B}) = (3\hat{i} + 4\hat{j} - 5\hat{k}) \cdot (34\hat{i} - 13\hat{j} + 10\hat{k})$

$= 102 - 52 - 50 = 0$