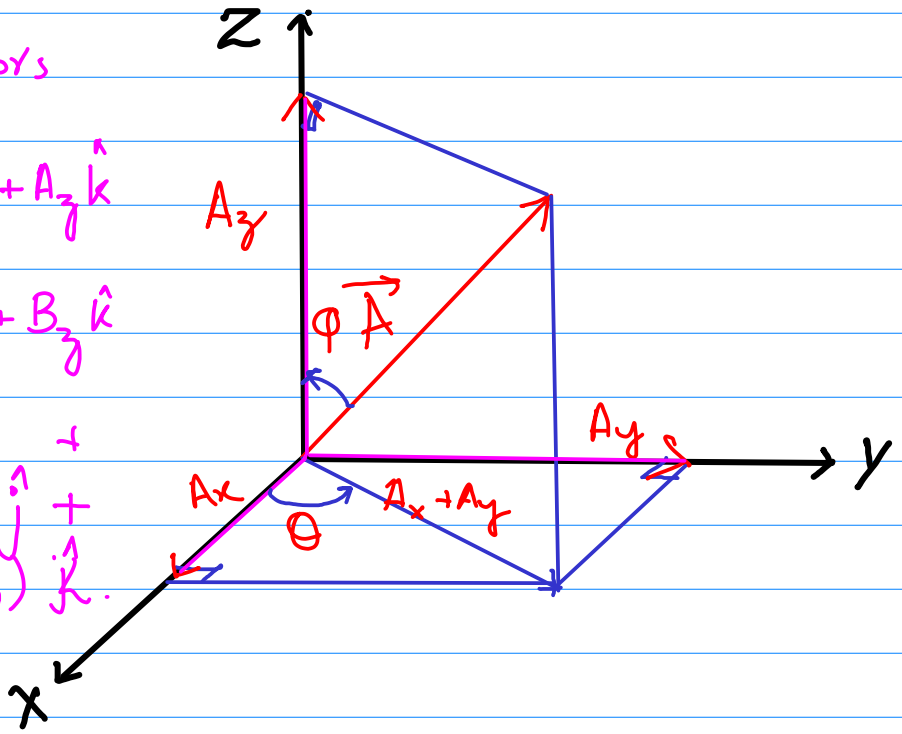
Vectors in Three Dimensions:

Addition of vectors

$\vec{A} = A_x \hat{i} + A_y \hat{j} + A_z \hat{k}$

$\vec{B} = B_x \hat{i} + B_y \hat{j} + B_z \hat{k}$

$\vec{A} + \vec{B} = (A_x + B_x)\hat{i} + (B_y + B_y)\hat{j} + (A_z + B_z)\hat{k}.$



Multiplication of Vectors:

→ Dot Product / Scalar Product

$\vec{A} \cdot \vec{B} = A_x B_x + A_y B_y + A_z B_z$ ⇒ $\hat{i} \cdot \hat{i} = 1$, $\hat{j} \cdot \hat{j} = 1$, $\hat{k} \cdot \hat{k} = 1$

→ Cross Product / Vector Product

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$$

$$= (A_y B_z - B_y A_z)\hat{i} - \hat{j}(A_x B_z - B_x A_z) + \hat{k}(A_x B_y - B_x A_y).$$