$$\frac{\overrightarrow{ab}}{\|\overrightarrow{ab}\|} = \frac{(2,5,-4)}{3\sqrt{5}} = \frac{2}{3\sqrt{5}} i + \frac{5}{3\sqrt{5}} j - \frac{4}{3\sqrt{5}} k$$

then $\vec{v} = \|\vec{v}\| \left(\frac{\overrightarrow{ab}}{\|\overrightarrow{ab}\|} \right) = \sqrt{5} \left(\frac{2}{3\sqrt{5}} i + \frac{5}{3\sqrt{5}} j - \frac{4}{3\sqrt{5}} k \right)$

$$= \left(\frac{2}{3} i + \frac{5}{3} j - \frac{4}{3} k \right)$$

$$= \left(\frac{2}{3}, \frac{5}{3}, \frac{-4}{3} \right)$$

Dot Product الضرب النقطي

Definition: If $\vec{u} = (u_1, u_2)$ & $\vec{v} = (v_1, v_2)$ are vectors in $\mathbb{R}^2$ then the dot product of $\vec{u}$ and $\vec{v}$ is denoted by $\vec{u} \cdot \vec{v}$ and defined by:

$$\vec{u} \cdot \vec{v} = (u_1, u_2) \cdot (v_1, v_2) = u_1 v_1 + u_2 v_2$$

Similarly, if $\vec{u} = (u_1, u_2, u_3)$ & $\vec{v} = (v_1, v_2, v_3)$ are vectors in $\mathbb{R}^3$ then their dot product is denoted by $\vec{u} \cdot \vec{v}$ and defined by:

$$\vec{u} \cdot \vec{v} = (u_1, u_2, u_3) \cdot (v_1, v_2, v_3) = u_1 v_1 + u_2 v_2 + u_3 v_3$$

Note: the dot product of two vectors is not a vector but a scalar.