Answer on Question #46935 – Math – Vector Calculus

Question.

Find p such that the vectors $w = pi + 3j$ and $v = 2i + qj$ are parallel to $u = 5i + 6j$.

2.7
2.5
3.5
4.1

Solution.

By definition, the magnitude of the cross product is calculated by the following formula:

$$\left|\vec{a} \times \vec{b}\right| = |\vec{a}||\vec{b}| \sin \alpha$$

So, if vectors $\vec{a}$ and $\vec{b}$ are parallel $\rightarrow \alpha = \pi n \rightarrow \sin \alpha = 0 \rightarrow \vec{a} \times \vec{b} = \vec{0}$.

Therefore, we must use the condition $\vec{w} \times \vec{u} = \vec{0}$.

In our case, the coordinates of vectors are the following:

$\vec{w} = (p; 3; 0)$

$\vec{u} = (5; 6; 0)$

Let find the value of p using the condition $\vec{w} \times \vec{u} = \vec{0}$:

$$\vec{w} \times \vec{u} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ p & 3 & 0 \\ 5 & 6 & 0 \end{vmatrix} = \vec{i} \cdot 0 + \vec{j} \cdot 0 + \vec{k} \cdot (6p - 15) = \vec{k} \cdot (6p - 15) = 0 \rightarrow p = 2.5$$

Answer.

2.5