

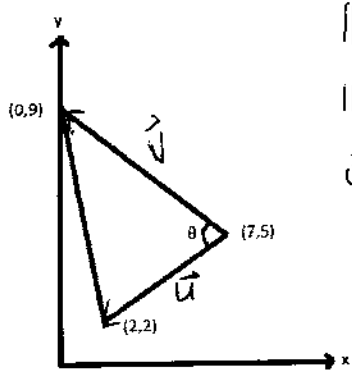
Name: Key

Calculus 251:C3 Quiz #3 - 5/28/2020 Topic: Sections 12.3-12.4

Instructions. Answer the questions in the spaces provided or on your own paper, then scan and upload to Canvas. Show and label all of your work. Responses with no work may receive no credit even if the answer is correct.

3 pts

- (1) Find the measure of angle θ in the diagram below. You do not need to simplify your answer (i.e. you do not need to simplify radicals, and you can leave your answer in terms of an inverse trigonometric function if appropriate)



$$\begin{aligned} \vec{u} &= \langle -5, -3 \rangle \\ \vec{v} &= \langle -7, 4 \rangle \\ \theta &= \cos^{-1} \left(\frac{23}{\sqrt{34} \sqrt{65}} \right) \\ \|\vec{u}\| &= \sqrt{25+9} = \sqrt{34} \\ \|\vec{v}\| &= \sqrt{49+16} = \sqrt{65} \\ \vec{u} \cdot \vec{v} &= 35 - 12 = 23 \\ \cos \theta &= \frac{\vec{u} \cdot \vec{v}}{\|\vec{u}\| \|\vec{v}\|} = \frac{23}{\sqrt{34} \sqrt{65}} \\ \theta &= \cos^{-1} \left(\frac{23}{\sqrt{34} \sqrt{65}} \right) \end{aligned}$$

3 pts

- (2) Find all values of a such that $\vec{u} = 6\hat{i} - 2\hat{j} + a\hat{k}$ and $\vec{v} = a\hat{i} + 5\hat{j} - 8\hat{k}$ are orthogonal.

$$a = \underline{-5}$$

$$\begin{aligned} \vec{u} \cdot \vec{v} &= 6a - 10 - 8a \\ 0 &= -2a - 10 \\ 2a &= -10 \\ a &= -5 \end{aligned}$$

4 pts

(3) Find $\vec{v} \times \vec{w}$

$$\vec{v} = 3\hat{i} - \hat{j} - 4\hat{k} \text{ and } \vec{w} = 2\hat{i} - 5\hat{k}$$

$$\vec{v} \times \vec{w} = \underline{5\hat{i} + 7\hat{j} + 2\hat{k}}$$

$$\begin{aligned} \vec{v} \times \vec{w} &= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & -1 & -4 \\ 2 & 0 & -5 \end{vmatrix} = \begin{vmatrix} -1 & -4 \\ 0 & -5 \end{vmatrix} \hat{i} - \begin{vmatrix} 3 & -4 \\ 2 & -5 \end{vmatrix} \hat{j} + \begin{vmatrix} 3 & -1 \\ 2 & 0 \end{vmatrix} \hat{k} \\ &= 5\hat{i} + 7\hat{j} + 2\hat{k} \end{aligned}$$