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6. Vector decomposition

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Problem Set A due Aug 18, 2021 20:30 IST Completed

2A-8

2.0/2 points (graded)

Find the vectors $\vec{a}$ and $\vec{b}$ such that $\langle 3,1\rangle = \vec{a} + \vec{b}$ where $\vec{a}$ is parallel to $\langle 1,1\rangle$ and $\vec{b}$ is perpendicular to $\langle 1,1\rangle$.

$\vec{a} =$ [2,2] ✔ **Answer:** [2,2]

$\vec{b} =$ [1,-1] ✔ **Answer:** [1,-1]

? INPUT HELP

Solution:

Note that the unit vector $\hat{u}$ in the direction of $\langle 1,1\rangle$ is $\langle \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\rangle$. So to find $\vec{a}$, we compute

$$\vec{a} = (\langle 3,1\rangle \cdot \hat{u})\,\hat{u} = \frac{4}{\sqrt{2}}\langle \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\rangle = \langle 2,2\rangle.$$

Since $\langle 3,1\rangle = \vec{a} + \vec{b}$, we can find $\vec{b}$ by computing

$$\vec{b} = \langle 3,1\rangle - \vec{a} = \langle 1,-1\rangle.$$

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Answers are displayed within the problem

6. Vector decomposition

Topic: Unit 2: Geometry of Derivatives / 6. Vector decomposition

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- minor typos — Hello. You may want to use hat u for unit vector in the solution. Best wishes. — 2
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