

Recitation #25: Vectors in the plane - Instructor Notes

Warm up:

- (a) What is the difference between the notations \hat{i} , \hat{j} , \hat{u} and \mathbf{i} , \mathbf{j} , \mathbf{u} ?
- (b) Sketch the vectors $\mathbf{u} = \langle 1, -1 \rangle$ and $\mathbf{v} = \langle 2, 0 \rangle$. Now using your sketch of these vectors, sketch $\mathbf{u} - 2\mathbf{v}$.

Instructor Notes: Reminds students that there are different equivalent vector notations. Also, students should understand vector addition geometrically.

Group work:

Problem 1 Suppose that $\mathbf{u} = \langle 5, -1 \rangle$ and $\mathbf{v} = \langle 2, 3 \rangle$. Find the following quantities:

- (a) $-\mathbf{v}$
 - (b) $3\mathbf{u} - 4\mathbf{v}$
 - (c) $|\mathbf{u}|$
 - (d) $|\mathbf{u} - 2\mathbf{v}|$
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Instructor Notes: Simple vector operations

Problem 2 Suppose that $\mathbf{u} = 3\mathbf{i} - 4\mathbf{j}$. Find the following:

- (a) A unit vector in the same direction of \mathbf{u} .
- (b) All unit vectors parallel to \mathbf{u} . (How does differ from part (a)?)

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- (c) Two vector parallel to \mathbf{u} with length 10.
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Instructor Notes: This question gauges whether they know the difference between vectors in the same direction and parallel vectors.

Problem 3 Assume that $\vec{u} = \frac{1}{2}\hat{i} + \frac{\sqrt{3}}{2}\hat{j}$ and $\vec{v} = \frac{\sqrt{3}}{2}\hat{i} - \frac{1}{2}\hat{j}$.

- (a) Show that \vec{u} and \vec{v} are unit vectors.
- (b) Write \hat{i} as $a_1\vec{u} + b_1\vec{v}$ for some real numbers a_1 and b_1 .
- (c) Write \hat{j} as $a_2\vec{u} + b_2\vec{v}$ for some real numbers a_2 and b_2 .
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Instructor Notes: Students tend to have issues writing a vector as a linear combination of other vectors.
