Precalculus Vector Test

Instructions

Complete all questions on your own paper. Show all work for full credit. Answers without supporting work will receive no credit.

Basic Vector Addition

1. Given vectors $\vec{a} = 3\hat{i} + 4\hat{j}$ and $\vec{b} = -1\hat{i} + 2\hat{j}$, find the vector sum $\vec{a} + \vec{b}$.
2. If $\vec{c} = 5\hat{i} - 3\hat{j}$ and $\vec{d} = 2\hat{i} + 6\hat{j}$, calculate $\vec{c} + \vec{d}$.

Resolving Vectors into Components

3. Resolve the vector $\vec{e} = 7\hat{i} - 7\sqrt{3}\hat{j}$ into its magnitude and direction.
4. For vector $\vec{f} = 12\cos(60°)\hat{i} + 12\sin(60°)\hat{j}$, find its rectangular components.

Converting Between Rectangular and Polar Notation

5. Convert the vector $\vec{g} = 4\hat{i} + 3\hat{j}$ to polar notation.
6. Convert the vector given in polar form $R = 10, \theta = 45°$ to rectangular notation.

Magnitude of Vectors

7. Find the magnitude of $\vec{h} = -6\hat{i} + 8\hat{j}$.
8. Calculate the magnitude of $\vec{i} = 9\hat{i} - 12\hat{j}$.

Unit Vectors

9. Find the unit vector in the direction of $\vec{j} = 3\hat{i} - 4\hat{j}$.
10. Determine the unit vector of $\vec{k} = \sqrt{2}\hat{i} + \sqrt{2}\hat{j}$.

Word Problems

11. A plane flies 300 km east and then 400 km south. Represent the plane's displacement as a vector in rectangular notation and find its magnitude.

12. A river flows with a current of 5 km/h in the east direction. A boat wants to reach a point directly across the river, north of its current position, which is 10 km away. If the boat can travel at 10 km/h relative to the water, find the actual velocity of the boat in rectangular form.

13. A person walks 8 km, 60 degrees north of east, and then walks 6 km east. Find the total displacement vector in both rectangular and polar forms.