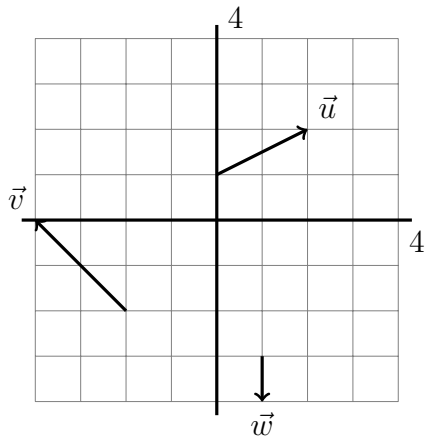
You will have at least 20 minutes to complete the quiz. You may use a calculator for computations, but your process must still be evident in the work you show.

1. [3 pts] Suppose the vector $\vec{v}$ points $20°$ to the *left* of the positive y-axis. Find the components of $\vec{v}$.

2. [2 pts] If $||\vec{u}|| = 20$, $||\vec{v}|| = 10$, and the angle between $\vec{u}$ and $\vec{v}$ is $45°$, what is $\vec{u} \cdot \vec{v}$?

3. [5 pts] Find a vector that is perpendicular to the vector $\vec{v} = 3\vec{i} + 4\vec{j}$, and prove that it is perpendicular.

4. [10 pts] Suppose the vectors $\vec{u}$, $\vec{v}$, and $\vec{w}$ are shown below.



(a) Write down the components of $\vec{u}, \vec{v}$, and $\vec{w}$.

(b) Find $2\vec{u} + 3\vec{w}$.

(a) What is $\vec{u} \cdot \vec{w}$?

(b) If $\vec{u}$ and $\vec{v}$ are placed tail-to-tail, what is the angle that they make?

(c) Are any of the vectors $\vec{u}, \vec{v}, \vec{w}$ perpendicular? Explain.