

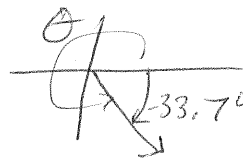
Given $\vec{u} = \langle 1, 2 \rangle$ and $\vec{v} = \langle 3, -2 \rangle$ answer questions 1-3.

1. Find the magnitude of the vector \vec{v} (2pt)

$$\|\vec{v}\| = \sqrt{3^2 + (-2)^2} = \sqrt{9 + 4} = \sqrt{13}$$

2. Find the direction angle of the vector \vec{v} (3pt)

$$\theta' = |\arctan\left(\frac{-2}{3}\right)| = 33.7^\circ$$



$$\theta = 360 - 33.7 = 326.3^\circ$$

3. Find $2\vec{v} - 3\vec{u}$ Write your answer as a linear combination of the standard vectors $\vec{i} = \langle 1, 0 \rangle$, $\vec{j} = \langle 0, 1 \rangle$. (3pt)

$$\begin{aligned} 2\langle 3, -2 \rangle - 3\langle 1, 2 \rangle &= \langle 6, -4 \rangle + \langle -3, -6 \rangle = \langle 3, -10 \rangle \\ &= 3\vec{i} - 10\vec{j} \end{aligned}$$

4. If a vector \vec{a} has magnitude 20 and direction angle of $\theta = \frac{5\pi}{3}$.

Give the exact value of the vertical component (the \vec{j} component). (3pt)

$$\begin{aligned} \vec{a} &= 20 \cos\left(\frac{5\pi}{3}\right) \vec{i} + 20 \sin\left(\frac{5\pi}{3}\right) \vec{j} \\ &= 10 \vec{i} + -10\sqrt{3} \vec{j} \end{aligned}$$



$$\boxed{-10\sqrt{3}}$$

Bonus If a baseball bat and ball cost a total of \$1.10 and the bat costs \$1 more than the ball, how much does each cost?