

Math 233 - Quiz 1

August 21, 2025

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (1 point) The vector $\vec{u} = \langle 3, -5 \rangle$ has initial point $(10, -6)$. Find its terminal point.

$$\langle 3, -5 \rangle = \langle x - 10, y - (-6) \rangle \Rightarrow \begin{aligned} x - 10 &= 3 \Rightarrow x = 13 \\ y + 6 &= -5 \Rightarrow y = -11 \end{aligned}$$

2. (4 points) Let \vec{w} be the vector from $P(-2, 7)$ to $Q(3, -1)$.

$$(13, -11)$$

- (a) Find the component form of \vec{w} .

$$\vec{w} = \vec{PQ} = \langle 3 - (-2), -1 - 7 \rangle = \langle 5, -8 \rangle$$

- (b) Compute $\|\vec{w}\|$.

$$\|\vec{w}\| = \sqrt{5^2 + (-8)^2} = \sqrt{25 + 64} = \sqrt{89}$$

- (c) Find a unit vector whose direction is opposite that of \vec{w} .

$$-\frac{\vec{w}}{\|\vec{w}\|} = -\frac{1}{\sqrt{89}} \langle 5, -8 \rangle = \left\langle -\frac{5}{\sqrt{89}}, \frac{8}{\sqrt{89}} \right\rangle$$

- (d) Compute $\|2\vec{w}\|$.

$$\|2\vec{w}\| = 2\|\vec{w}\| = 2\sqrt{89}$$

3. (2 points) Find a vector of length 13 that has the direction of $\vec{v} = \langle 4, -3 \rangle$.

$$\|\vec{v}\| = \sqrt{4^2 + (-3)^2} = \sqrt{25} = 5 \quad \frac{13\vec{v}}{\|\vec{v}\|} = \frac{13}{5} \langle 4, -3 \rangle = \left\langle \frac{52}{5}, -\frac{39}{5} \right\rangle$$

4. (1 point) Fill in the appropriate words: A vector is uniquely determined by its MAGNITUDE and DIRECTION.

5. (2 points) Let $\vec{x} = \langle 2, 1 \rangle$ and $\vec{y} = \langle 2, -2 \rangle$. Compute $\|2\vec{x} - 4\vec{y}\|$.

$$\vec{u} = 2\vec{x} - 4\vec{y} = \langle 4, 2 \rangle - \langle 8, -8 \rangle$$

$$= \langle -4, 10 \rangle$$

$$\|\vec{u}\| = \sqrt{(-4)^2 + 10^2} = \sqrt{116} = 2\sqrt{29}$$

$$\approx 10.7703$$