

Math 173 - Quiz 1
January 18, 2018

Name key Score _____

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

1. (2 points) A vector has initial point (1, -2). Find a possible terminal point if the vector has slope 3/7.

$$\frac{y+2}{x-1} = \frac{3}{7} \quad \text{We can go with } y=1, x=8$$

$$(8, 1)$$

2. (2 points) Are the vectors $\vec{v} = -6\hat{i} - 2\hat{j}$ and $\vec{u} = \hat{i} + 3\hat{j}$ perpendicular? Show your work.

Slope of \vec{v}
is $\frac{-2}{-6} = \frac{1}{3}$

Slope of \vec{u}
is $\frac{3}{1} = 3$

SLOPES ARE NOT NEG. RECIPROCALLS!
NOT PERP.

3. (3 points) The vector \vec{u} is the 2D vector that has magnitude 3 and makes a 150° angle with the positive x -axis. The vector \vec{v} is the 2D vector that has magnitude 7 and makes a 60° angle with the positive x -axis. Compute $\vec{u} + \vec{v}$. Write your result in decimal form with components rounded to three digits.

$$\vec{u} = 3 \cos 150^\circ \hat{i} + 3 \sin 150^\circ \hat{j} = -\frac{3\sqrt{3}}{2} \hat{i} + \frac{3}{2} \hat{j}$$

$$\vec{v} = 7 \cos 60^\circ \hat{i} + 7 \sin 60^\circ \hat{j} = \frac{7}{2} \hat{i} + \frac{7\sqrt{3}}{2} \hat{j}$$

$$\vec{u} + \vec{v} = \frac{7-3\sqrt{3}}{2} \hat{i} + \frac{3+7\sqrt{3}}{2} \hat{j}$$

$$\approx 0.902 \hat{i} + 7.562 \hat{j}$$

4. (3 points) Find two unit vectors that are parallel to the graph of $y = \tan^{-1} 2x$ at the point where $x = 2$.

$$\frac{dy}{dx} = \frac{2}{1+(2x)^2} \Rightarrow m = \left. \frac{dy}{dx} \right|_{x=2} = \frac{2}{17}$$

A VECTOR WITH THIS SLOPE IS $17\hat{i} + 2\hat{j}$

MAGNITUDE IS $\sqrt{(17)^2 + (2)^2} = \sqrt{293}$

UNIT VECTORS ARE $\pm \frac{1}{\sqrt{293}} (17\hat{i} + 2\hat{j})$