

Math 173 - Quiz 1

January 19, 2017

Name key

Slope _____

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

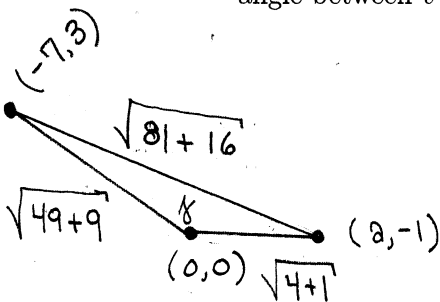
1. (2 points) Find two unit vectors that have slope $-2/5$.

Slope $-2/5$: $5\hat{i} - 2\hat{j}$

MAGNITUDE = $\|5\hat{i} - 2\hat{j}\| = \sqrt{25+4} = \sqrt{29}$

UNIT VECTORS ARE $\pm \frac{1}{\sqrt{29}} (5\hat{i} - 2\hat{j})$

2. (3 points) Suppose $\vec{v} = 2\hat{i} - \hat{j}$ and $\vec{u} = -7\hat{i} + 3\hat{j}$. Use the law of cosines to find the angle between \vec{v} and \vec{u} .



$$97 = 58 + 5 - 2\sqrt{58}\sqrt{5} \cos \gamma$$

$$\cos \gamma = \frac{97 - 58 - 5}{-2\sqrt{58}\sqrt{5}} = \frac{-17}{\sqrt{58}\sqrt{5}}$$

$$\gamma = \cos^{-1}\left(\frac{-17}{\sqrt{58}\sqrt{5}}\right) \approx 176.6^\circ$$

3. (2 points) Find a vector of magnitude 3 whose direction is the same as that of $\vec{w} = 2\hat{i} - 3\hat{j}$.

$$\|\vec{w}\| = \sqrt{4+9} = \sqrt{13}$$

$$\frac{3}{\sqrt{13}} \vec{w} = \frac{6}{\sqrt{13}} \hat{i} - \frac{9}{\sqrt{13}} \hat{j}$$

4. (3 points) Find two vectors that are normal (perpendicular) to the graph of $y = \sin 2x$ at the point $(\pi, 0)$.

$$\frac{dy}{dx} = 2 \cos 2x$$

$$m = \left. \frac{dy}{dx} \right|_{x=\pi} = 2$$

$$m_{\perp} = -\frac{1}{2}$$

PARALLEL...

$$\vec{u} = \hat{i} + 2\hat{j}$$

$$\|\vec{u}\| = \sqrt{1+4} = \sqrt{5}$$

$$\pm \frac{1}{\sqrt{5}} (\hat{i} + 2\hat{j})$$

PERPENDICULAR...

$$\vec{v} = 2\hat{i} - \hat{j}$$

$$\|\vec{v}\| = \sqrt{5}$$

$$\pm \frac{1}{\sqrt{5}} (2\hat{i} - \hat{j})$$