Math 49B
Quiz 8
Fri Mar 14, 2008

$-\frac{1}{2}$ POINT EACH TIME YOU DON'T USE CORRECT $\langle , \rangle$ OR $\vec{i}, \vec{j}$ NOTATION

Code: _____

[redacted]

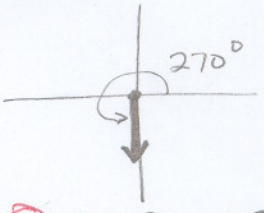
Let **u** be the vector with initial point (3, –4) and terminal point (–1, –1).
Let **v** be the vector with magnitude 6 and direction angle 270°.
Let **w** = –2**i** – 5**j**.

[1 POINT] Find the component form of **u**.

$\langle -1-3, -1-(-4) \rangle$
$= \langle -4, 3 \rangle$ $\frac{1}{2}$ $\frac{1}{2}$

[2 POINT] Find the component form of **v**.

$\langle 6\cos 270°, 6\sin 270° \rangle$
$= \langle 0, -6 \rangle$ 1 1



[1 POINT] Find the vector with magnitude 4 in the same direction as **w**.

$\frac{1}{\|\vec{w}\|}\vec{w} = \frac{1}{\sqrt{(-2)^2+(-5)^2}}\langle -2, -5 \rangle$
$= \frac{1}{\sqrt{29}}\langle -2, -5 \rangle$ 1 $\frac{1}{2}$
$= \left\langle \frac{-2}{\sqrt{29}}, \frac{-5}{\sqrt{29}} \right\rangle$ $\frac{1}{2}$ $\frac{1}{2}$

$4\left(\frac{1}{\|\vec{w}\|}\vec{w}\right) = 4\left\langle -\frac{2}{\sqrt{29}}, -\frac{5}{\sqrt{29}} \right\rangle$ $\frac{1}{2}$
$= \left\langle \frac{-8}{\sqrt{29}}, \frac{-20}{\sqrt{29}} \right\rangle$
$\frac{1}{2}$ $\frac{1}{2}$

[2 POINT] Find the direction angle for the vector **u**.

$180° + \tan^{-1}\left(\frac{3}{-4}\right)$ 2
$= 143.13°$

[1 POINT] Find **w**·**v**.

$(-2)(0) + (-5)(-6)$
$= 30$ 1

[3 POINT] Find the angle between **u** and **w**.

$\theta = \cos^{-1}\frac{\vec{u}\cdot\vec{w}}{\|\vec{u}\|\|\vec{w}\|}$ 1
$= \cos^{-1}\frac{(-2)(-4)+(-5)(3)}{\sqrt{(-4)^2+3^2}\sqrt{29}}$
$= \cos^{-1}\frac{-7}{5\sqrt{29}}$ 1 1
$= 105.07°$

[4 POINT] Find the projection of **w** onto **u**.

$\text{PROJ}_{\vec{u}}\vec{w} = \frac{\vec{w}\cdot\vec{u}}{\vec{u}\cdot\vec{u}}\vec{u}$ 1
$= \frac{-7}{25}\langle -4, 3 \rangle$ $\frac{1}{2}$ 1 $\frac{1}{2}$
$= \left\langle \frac{28}{25}, \frac{-21}{25} \right\rangle$
$\frac{1}{2}$ $\frac{1}{2}$

[3 POINT] Use the answer from the previous question to write **w** as the sum of two orthogonal vectors, one of which is $\text{proj}_{\mathbf{u}}\,\mathbf{w}$.

$\langle -2, -5 \rangle - \left\langle \frac{28}{25}, \frac{-21}{25} \right\rangle = \left\langle \frac{-78}{25}, \frac{-104}{25} \right\rangle$ 1 $\frac{1}{2}$ $\frac{1}{2}$

$\langle -2, -5 \rangle = \left\langle \frac{28}{25}, \frac{-21}{25} \right\rangle + \left\langle \frac{-78}{25}, \frac{-104}{25} \right\rangle$ 1