"QUIZ" for Lecture 2

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E-MAIL ADDRESS SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q2FirstLast.pdf) ASAP BUT NO LATER THAN FRIDAY Sept. 11, 8:00pm ______________________

1. Determine whether the two vectors are orthogonal and if not, whether the angle between them is acute or obtuse. **a.** $\langle 1,1,1 \rangle$, $\langle 3,-2,-1 \rangle$.

b. $\langle 4,3 \rangle$, $\langle 2,-4 \rangle$.

Two vectors are orthogonal if their dot product is equal to 0

a) $\langle 1,1,1 \rangle \cdot \langle 3,-2,-1 \rangle = (1 \cdot 3) + (1 \cdot -2) + (1 \cdot -1) =$
$= 3 - 2 - 1 = 0 \rightarrow \boxed{\text{Orthogonal}}$

$\theta = \cos^{-1}\left(\frac{\langle 1,1,1 \rangle \cdot \langle 3,-2,-1 \rangle}{\|\langle 1,1,1 \rangle\| \|\langle 3,-2,-1 \rangle\|}\right) = \cos^{-1}\left(\frac{0}{\sqrt{3} \cdot \sqrt{14}}\right) = \cos^{-1}(0) = 90^{\circ}$

The angle between those vectors is a $\boxed{\text{right angle}}$

b) $\langle 4,3 \rangle \cdot \langle 2,-4 \rangle = (4 \cdot 2) + (3 \cdot -4) = 8 - 12 = -4 \rightarrow \boxed{\text{Not orthogonal}}$

$\theta = \cos^{-1}\left(\frac{\langle 4,3 \rangle \cdot \langle 2,-4 \rangle}{\|\langle 4,3 \rangle\| \|\langle 2,-4 \rangle\|}\right) = \cos^{-1}\left(\frac{-4}{\sqrt{16+9} \cdot \sqrt{4+16}}\right) = \cos^{-1}\left(\frac{-4}{\sqrt{25} \cdot \sqrt{20}}\right) =$
$= \cos^{-1}\left(\frac{-4}{10\sqrt{5}}\right) \approx 100.3^{\circ} \rightarrow$ The angle between those vectors is an $\boxed{\text{obtuse angle}}$.

2. Calculate $\mathbf{v} \times \mathbf{w}$, if

$$\mathbf{v} = \langle 0,1,-1 \rangle \quad , \quad \mathbf{w} = \langle 1,-1,0 \rangle \quad .$$

$$\vec{V} \times \vec{W} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 1 & -1 \\ 1 & -1 & 0 \end{vmatrix} = \hat{i}\,(\overset{0}{1 \cdot 0} - \overset{-1}{(-1)\cdot(-1)}) - \hat{j}\,(0 \cdot 0 - \overset{1}{1 \cdot (-1)}) + \hat{k}\,(0 \cdot (-1) - \overset{-1}{1 \cdot 1}) =$$

$$= -\hat{i} - \hat{j} - \hat{k} \rightarrow \boxed{\langle -1, -1, -1 \rangle}.$$