"QUIZ" for Lecture 2

NAME: (print!) Rachel Baiji **Section:** 23

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

$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - cb$

① a.

$$\begin{vmatrix} i & j & k \\ 1 & 1 & 1 \\ 3 & -2 & -1 \end{vmatrix} = i\begin{vmatrix} 1 & 1 \\ -2 & -1 \end{vmatrix} - j\begin{vmatrix} 1 & 1 \\ 3 & -1 \end{vmatrix} + k\begin{vmatrix} 1 & 1 \\ 3 & -2 \end{vmatrix}$$

$= i(-1+2) - j(-1-3) + k(-2-3)$

$= i + 4j - 5k$ or $\langle 1,4,-5\rangle$

② $\langle 1,4,-5\rangle \cdot \langle 1,1,1\rangle = 1+4-5 = 0$

$\langle 1,4,-5\rangle \cdot \langle 3,-2,-1\rangle = 3-8+5 = 0$

∴ Both dot products are zero so the two vectors are orthogonal.

b.

$$\begin{vmatrix} i & j \\ 4 & 3 \\ 2 & -4 \end{vmatrix} = -16-6 = -22 \neq \pm 0$$ so not orthogonal

Finding the angle between the 2 vectors:

$\cos\theta = \dfrac{(a_1b_1 + a_2b_2 + a_3b_3)}{(|A||B)}$

$\cos\theta = \dfrac{(6+-12)}{10\sqrt{5}} = \dfrac{-4}{10\sqrt{5}}$

$|A| = \sqrt{16+9} = \sqrt{25} = 5$

$|B| = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$

$\theta = 100.304°$

∴ The angle between the two vectors is obtuse.

2. Calculate $\mathbf{v} \times \mathbf{w}$, if $\mathbf{v} = \langle 0,1,-1\rangle$, $\mathbf{w} = \langle 1,-1,0\rangle$.

$a_1\ a_2\ a_3$

①

$$\begin{vmatrix} i & j & k \\ 0 & 1 & -1 \\ 1 & -1 & 0 \end{vmatrix} = i\begin{vmatrix} 1 & -1 \\ -1 & 0 \end{vmatrix} - j\begin{vmatrix} 0 & -1 \\ 1 & 0 \end{vmatrix} + k\begin{vmatrix} 0 & 1 \\ 1 & -1 \end{vmatrix}$$

$= i(1(0) - (-1)(-1)) - j(0(0) - (-1)(1)) + k(0-1) - (1)(1))$

$= -i - j - k \longrightarrow \langle -1,-1,-1\rangle$

∴ $V \times W = -i - j - k$

or

$\langle -1,-1,-1\rangle$