Subject: Problem Set 1

Year. Month. Date. ( )

1 A-6 $(200+25\sqrt{2})i+25\sqrt{2}j$

1 A-7 a) $6i-aj$ b) $-bi+aj$ c) $\frac{1}{5}\sqrt{3^2+4^2}=1$

$j=-\frac{4}{5}i+\frac{3}{5}j$

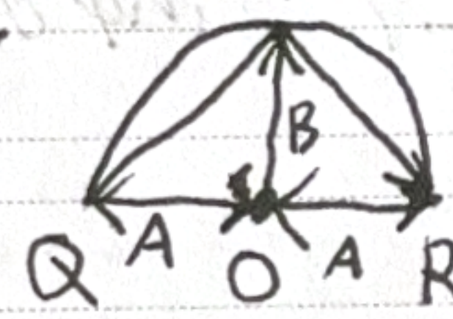
1 A-9 $\vec{x}=B/2-A/2=\frac{1}{2}C=\frac{1}{2}B-A$

1 B-2 $(C\cdot 1)+2\cdot(-1)+(-1)\cdot 2=C-4$

a) $C=4$ b) $C<4$

1 B-5 b) $\frac{2\cdot 3+(-2)\cdot 2+1(-6)}{\sqrt{3^2+2^2+6^2}}=\frac{-4}{7}$

1 B-12



$PQ\cdot PR=(A+B)\cdot(A-B)=0$

1 B-13 $u_1=\cos\theta_1 i+\sin\theta_1 j$

$u_2=\cos\theta_2 i+\sin\theta_2 j$

$\cos(\theta_2-\theta_1)=\frac{u_1\cdot u_2}{|u_1||u_2|}=\cos\theta_1\cos\theta_2+\sin\theta_1\sin\theta_2$

1 C-2 a) $-1\begin{vmatrix}2&2\\-2&-1\end{vmatrix}+0\begin{vmatrix}1&2\\3&-1\end{vmatrix}+4\begin{vmatrix}1&2\\3&-2\end{vmatrix}$

$=-34$

b) $-1\cdot\begin{vmatrix}2&2\\-2&-1\end{vmatrix}+(-1)\cdot 1\cdot\begin{vmatrix}2&2\\-2&-1\end{vmatrix}+3\begin{vmatrix}0&4\\2&2\end{vmatrix}$

$=-34$

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1C-5 a) $\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$

$\begin{vmatrix} a & b \\ c+ra & d+rb \end{vmatrix} = ad + rab - bc - rab = ad - bc$

1D-2 $A = PQ = i + j + (-1)k$

$B = PR = -3i + j + (-2)k$

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

$- \begin{vmatrix} 1 & -1 \\ -3 & -2 \end{vmatrix} j + \begin{vmatrix} 1 & 1 \\ -3 & 1 \end{vmatrix} k = -1i + (-5)j - 4k$

$\rightarrow \sqrt{1 + 5^2 + 4^2} = \sqrt{42}$ m $\longrightarrow \frac{1}{2}\sqrt{42}$

1D-5 a) $\theta = \pi/2$ b) $\theta = \pi/4$

Part II

1.

$n_1 = \langle 1,0,1 \rangle \times \langle 1,1,0 \rangle = \langle -1,1,1 \rangle$

$n_2 = \langle 1,1,0 \rangle \times \langle 0,1,1 \rangle = \langle 1,-1,1 \rangle$

$\cos\theta = \left| \frac{n_1 \cdot n_2}{|n_1||n_2|} \right| = 1/3 \rightarrow \theta = \cos^{-1}(1/3)$

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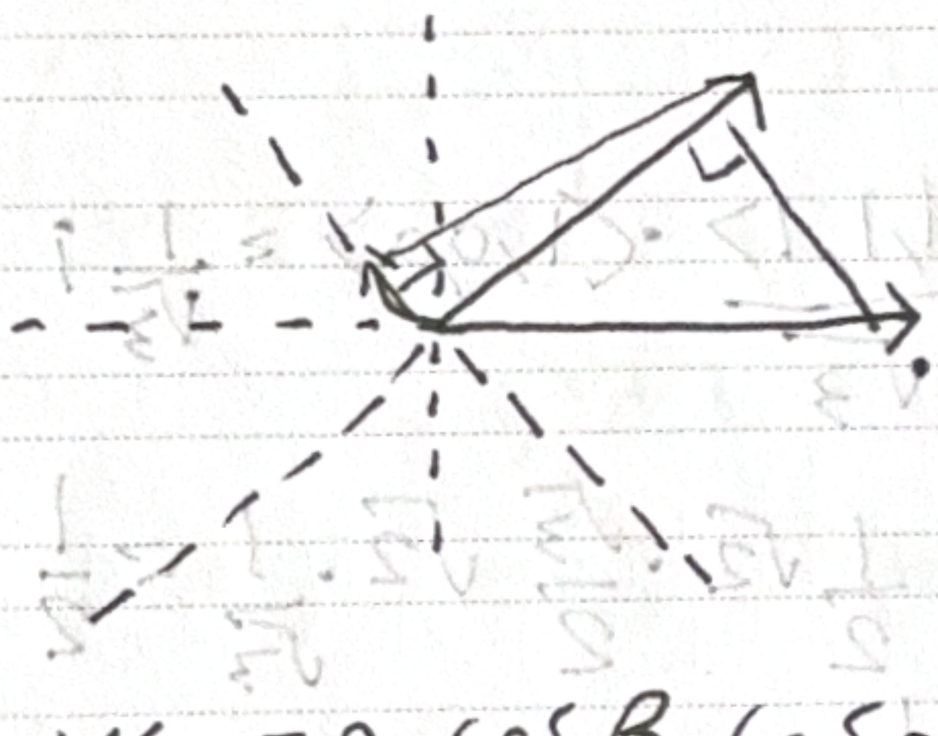
2 (a) $|u+v|^2 = u\cdot u + 2u\cdot v + v\cdot v$

$|u-v|^2 = u\cdot u - 2u\cdot v + v\cdot v$

$\rightarrow |u+v|^2 - |u-v|^2 = 4\, u\cdot v$

(b) $\dfrac{u+v}{|u+v|}$

3 (a)



(b) $w_2 = a\cos\beta\,\cos\alpha\,\langle\cos(\alpha+\beta), \sin(\alpha+\beta)\rangle$