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January 14, 2016
MAC 2313.9256
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Quiz 1
You must show all work to receive full credit!!

Problem 1. Let $\mathbf{u} = \langle 2, -1, 3\rangle$ and $\mathbf{v} = \langle -2, 3, 2\rangle$.
(a) (3 pts) Find a vector parametrization for the line passing through the point $(1, 4, -6)$ in the direction of the vector $\mathbf{u} + \mathbf{v}$.

$\vec{u} + \vec{v} = \langle 2, -1, 3\rangle + \langle -2, 3, 2\rangle = \langle 2-2, -1+3, 3+2\rangle = \langle 0, 2, 5\rangle$

Vector parametrization: $\vec{r}(t) = \langle x_0, y_0, z_0\rangle + t\langle a, b, c\rangle$

$= \langle 1, 4, -6\rangle + t\langle 0, 2, 5\rangle$

$= \boxed{\langle 1, 4+2t, -6+5t\rangle}$

(b) (2 pts) Determine whether the angle between $\mathbf{u}$ and $\mathbf{v}$ is acute or obtuse.

$\vec{u} \cdot \vec{v} = \langle 2, -1, 3\rangle \cdot \langle -2, 3, 2\rangle$

$= 2(-2) + (-1)(3) + 3\cdot(2) = -4 - 3 + 6 = \underline{-1}$

Since $\vec{u} \cdot \vec{v} = -1 < 0$, the angle between $\vec{u}$ and $\vec{v}$ is $\boxed{\text{obtuse}}$.

(c) (5 pts) Find the area of the parallelogram spanned by $\mathbf{u}$ and $\mathbf{v}$.

$$\vec{u} \times \vec{v} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & -1 & 3 \\ -2 & 3 & 2 \end{vmatrix} = \langle -1\cdot 2 - 3\cdot 3, -2\cdot 3 - 2\cdot 2, 2\cdot 3 - (-1)(-2)\rangle$$

$= \langle -2-9, -6-4, 6-2\rangle = \underline{\langle -11, -10, 4\rangle}$

Area $= \|\vec{u} \times \vec{v}\| = \|\langle -11, -10, 4\rangle\| = \sqrt{(-11)^2 + (-10)^2 + 4^2}$

$= \sqrt{121 + 100 + 16} = \boxed{\sqrt{237}}$