Name: SOLUTIONS

Student ID: _____

Quiz 9

Question 1. *(2 marks)* Find a vector normal to both $\vec{u} = (1,-2,3)$ and $\vec{v} = (0,-3,5)$.

$\vec{u} \times \vec{v} = \left(\det\begin{bmatrix} -2 & -3 \\ 3 & 5 \end{bmatrix}, -\det\begin{bmatrix} 1 & 0 \\ 3 & 5 \end{bmatrix}, \det\begin{bmatrix} 1 & 0 \\ -2 & -3 \end{bmatrix}\right)$

$= (-1, -5, -3)$

Question 2. *(3 marks)* Find the area of the parallelogram determined by the vectors $\vec{u} = (-6,0,2)$ and $\vec{v} = (2,2,3)$.

$\text{AREA} = \|\vec{u} \times \vec{v}\| = \left\|\left(\det\begin{bmatrix} 0 & 2 \\ 2 & 3 \end{bmatrix}, -\det\begin{bmatrix} -6 & 2 \\ 2 & 3 \end{bmatrix}, \det\begin{bmatrix} -6 & 2 \\ 0 & 2 \end{bmatrix}\right)\right\|$

$= \|(-4, 22, -12)\| = \sqrt{(-4)^2 + (22)^2 + (-12)^2}$

$= \sqrt{644} = 2\sqrt{161}$ units^2

Question 3. *(3 marks)* Find the volume of the parallelepiped determined by the vectors $\vec{u} = (4,0,-1)$, $\vec{v} = (3,1,7)$, and $\vec{w} = (-2,2,4)$.

$\text{VOLUME} = |\vec{u} \cdot (\vec{v} \times \vec{w})| = \left|\det\begin{bmatrix} 4 & 0 & -1 \\ 3 & 1 & 7 \\ -2 & 2 & 4 \end{bmatrix}\right|$

$= \left|4\det\begin{bmatrix} 1 & 7 \\ 2 & 4 \end{bmatrix} - \det\begin{bmatrix} 3 & 1 \\ -2 & 2 \end{bmatrix}\right|$

$= |4(-10) - (8)| = 48$ units^3