Quiz #5

1. **(3 points)** The vectors $\vec{u}$ and $\vec{v}$ are three-dimensional vectors that lie in the *xy*-plane. You may assume that the angle between the vectors is 150°, that $|\vec{u}| = 6$ and that $|\vec{v}| = 8$. Find the area of the parallelogram that has $\vec{u}$ and $\vec{v}$ as two of its sides.

2. In this problem $\vec{u}$, $\vec{v}$ and $\vec{w}$ will always refer to the following vectors:

$$\vec{u} = \langle 1, 2, -3 \rangle \qquad \vec{v} = \langle -7, -14, 21 \rangle \qquad \vec{w} = \langle 0, 1, 1 \rangle.$$

(a) **(1 point)** Calculate $\vec{v} \times \vec{w}$. Show your work and circle your final answer.

(b) **(2 points)** Calculate the volume of the parallelpiped whose sides are formed by the vectors $\vec{u}$, $\vec{v}$ and $\vec{w}$. Show your work and circle your final answer.

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(c) **(1 point)** Calculate $\vec{u} \times \vec{v}$. Show your work and circle your final answer.

(d) **(1 point)** What can you conclude about the vectors $\vec{u}$ and $\vec{v}$? Circle any of the statements that you believe to be true. Note that you will lose points for circling statements that are not true.

i. $\vec{u}$ and $\vec{v}$ are parallel (or anti-parallel).

ii. $\vec{u}$ and $\vec{v}$ are both perpendicular to the vector $\vec{v} \times \vec{w}$.

iii. $\vec{u}$ and $\vec{v}$ are orthogonal.

iv. $\vec{u}$ and $\vec{v}$ are unit vectors.

v. $\dfrac{\vec{u}}{|\vec{v}|}$ is a unit vector.

3. **(2 points)** Find an equation of the form:

$$\langle x, y, z \rangle = \langle x_0, y_0, z_0 \rangle + t \cdot \langle a, b, c \rangle$$

for the line that is formed by the intersection of the following planes:

$$x + y - z = 2$$

$$3x - 4y + 5z = 6.$$

Show all work and circle your final answer.