Name:

ID:

Math 2D:

1. If $v = \langle 1, -2, 1 \rangle$, $w = \langle 0, 1, 1 \rangle$, find the following:

a. $2w + v = \langle 0, 2, 2 \rangle + \langle 1, -2, 1 \rangle = \langle 1, 0, 3 \rangle$

b. $\widehat{v} = \dfrac{v}{\|v\|} = \dfrac{1}{\sqrt{1^2 + (-2)^2 + 1^2}} \langle 1, -2, 1 \rangle = \dfrac{1}{\sqrt{6}} \langle 1, -2, 1 \rangle$

c. $v \cdot w = 1(0) - 2(1) + 1(1) = -1$

d. $\text{comp}_w(v) = \dfrac{v \cdot w}{\|w\|} = -\dfrac{1}{\sqrt{0^2 + 1^2 + 1^2}} = -\dfrac{1}{\sqrt{2}}$

e. $\text{proj}_w(v) = \dfrac{v \cdot w}{\|w\|} \dfrac{w}{\|w\|} = -\dfrac{1}{2} \langle 0, 1, 1 \rangle$

f. $v \times w = \begin{vmatrix} i & j & k \\ 1 & -2 & 1 \\ 0 & 1 & 1 \end{vmatrix} = (-2 - 1)i - j + k = \langle -3, -1, 1 \rangle$

g. Find a vector in the direction of $v \times w$ with a magnitude of $2\sqrt{11}$

$$\frac{v \times w}{\|v \times w\|} = \frac{1}{\sqrt{11}} \langle -3, -1, 1 \rangle$$

The unit vector for $v \times w$ is given above, so a vector with a magnitude of $2\sqrt{11}$ in the direction of $v \times w$ is simply $2\sqrt{11} \left(\dfrac{1}{\sqrt{11}} \right) \langle -3, -1, 1 \rangle = \langle -6, -2, 2 \rangle$.