Lecture 3 Worksheet Charles Richardson

1. a. $i\ j\ k\ i\ j$
$-2\ 5\ 1\ -2\ 5$
$1\ 2\ -3\ 1\ 2$
$= -15\hat{i} + \hat{j} - 4\hat{k} - 2\hat{i} - 6\hat{j} - 5\hat{k}$
$= \boxed{-17\hat{i} - 5\hat{j} - 9\hat{k}}$ ✓

b. $i\ j\ k\ i\ j$
$1\ -4\ 2\ 1\ -4$
$0\ -1\ -1\ 0\ -1$
$= 4\hat{i} + 0 + (-1\hat{k}) + 2\hat{i} + \hat{j}$
$= \boxed{6\hat{i} + \hat{j} - \hat{k}}$ ✓

2. $\|\vec{v} \cdot \vec{v}\| = \|v\|\|v\|\sin\theta$
$= (54)\left(\frac{\sqrt{2}}{2}\right) = \boxed{27\sqrt{2}}$ ✓

3. a. $\boxed{\sqrt{38}}$ ✓

b. $\vec{v} \times \vec{v}$ $\begin{matrix} \hat{i} & \hat{j} & \hat{k} & \hat{i} & \hat{j} \\ -1 & 1 & 2 & -1 & 1 \\ 2 & 0 & 1 & 2 & 0 \end{matrix}$ $= \hat{i} + 4\hat{j} + 0 - 0 + \hat{j} - 2\hat{k}$
$\hat{i} + 5\hat{j} - 2\hat{k}$
$\|\vec{v} \times \vec{v}\| = \boxed{\sqrt{30}}$ ✓

4. $\vec{v} \times \vec{w} = \langle 0, 8, 7 \rangle$
$\vec{v} \times \vec{w} = \langle 5, -3, 4 \rangle$
$\vec{w} \times (\vec{v} + \vec{v}) = \vec{w} \times \vec{v} + \vec{w} \times \vec{v} = \boxed{\langle 5, 5, 10 \rangle}$ ✓

5. All but associative
Commutative does not work for cross prod