Math 397 Solutions Quiz 1

Name: Caleb McWhorter

1. (5 points) Consider the vectors

$$\vec{a} = \langle 1, 2, -1 \rangle \qquad \vec{b} = \langle 0, 3, 4 \rangle$$

Find $\vec{a} \times \vec{b}$.

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2 & -1 \\ 0 & 3 & 4 \end{vmatrix} = \hat{i}\begin{vmatrix} 2 & -1 \\ 3 & 4 \end{vmatrix} - \hat{j}\begin{vmatrix} 1 & -1 \\ 0 & 4 \end{vmatrix} + \hat{k}\begin{vmatrix} 1 & 2 \\ 0 & 3 \end{vmatrix}$$

$$= (8 - -3)\hat{i} - \hat{j}(4 - 0(-1)) + \hat{k}(3 - 0)$$

$$= 11\hat{i} - 4\hat{j} + 3\hat{k}$$

$$= \langle 11, -4, 3 \rangle$$

2. (5 points) Find the symmetric equation of the line passing through $(1, 3, -2)$ parallel to the vector $\langle 2, -1, 6 \rangle$.

$$\langle 2, -1, 6 \rangle t + \langle 1, 3, -2 \rangle$$

$$\begin{cases} x = 2t + 1 \\ y = 3 - t \\ z = 6t - 2 \end{cases}$$

So

$$t = \frac{x-1}{2}$$

$$t = 3 - y$$

$$t = \frac{z+2}{6}$$

$$\longrightarrow \quad \frac{x-1}{2} = \frac{3-y}{1} = \frac{z+2}{6}$$

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1. (5 points) Consider the vectors

$$\vec{a} = \langle 2, -1, 3 \rangle \qquad \vec{b} = \langle 1, 0, 4 \rangle$$

Find $\vec{a} \times \vec{b}$.

$$\begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 2 & -1 & 3 \\ 1 & 0 & 4 \end{vmatrix} = \hat{\imath}\begin{vmatrix} -1 & 3 \\ 0 & 4 \end{vmatrix} - \hat{\jmath}\begin{vmatrix} 2 & 3 \\ 1 & 4 \end{vmatrix} + \hat{k}\begin{vmatrix} 2 & -1 \\ 1 & 0 \end{vmatrix}$$

$$= \hat{\imath}(-4 - 0) - \hat{\jmath}(8 - 3) + \hat{k}(0 - -1)$$

$$= -4\hat{\imath} - 5\hat{\jmath} + \hat{k}$$

$$= \langle -4, -5, 1 \rangle$$

2. (5 points) Find the symmetric equation of the line passing through $(0, -2, 1)$ parallel to the vector $\langle 3, 1, -5 \rangle$.

$$\langle 3, 1, -5 \rangle t + \langle 0, -2, 1 \rangle$$

$$\begin{cases} x = 3t \\ y = t - 2 \\ z = -5t + 1 \end{cases}$$

So

$$t = x/3$$
$$t = y + 2$$
$$t = \frac{z-1}{-5}$$

$$\longrightarrow \quad \frac{x}{3} = \frac{y+2}{1} = \frac{z-1}{-5}$$