

SHOW ALL WORK!!! Unsupported answers might not receive full credit.

Problem 1 [4 pts] Suppose $\vec{u} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{v} = 2\hat{i} + \hat{j} - 3\hat{k}$

a) [2 pts] Find $\vec{u} \times \vec{v}$. $\langle 1, -1, 1 \rangle \times \langle 2, 1, -3 \rangle$

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

$$(3-1)\hat{i} - (-3-2)\hat{j} + (1+2)\hat{k} = 2\hat{i} + 5\hat{j} + 3\hat{k} = \langle 2, 5, 3 \rangle$$

b) [2 pts] Find a unit vector perpendicular to both \vec{u} and \vec{v}

$$\frac{\vec{u} \times \vec{v}}{|\vec{u} \times \vec{v}|}$$

$$\frac{\langle 2, 5, 3 \rangle}{\sqrt{2^2 + 5^2 + 3^2}} = \left\langle \frac{2}{\sqrt{38}}, \frac{5}{\sqrt{38}}, \frac{3}{\sqrt{38}} \right\rangle$$

Problem 2 [2 pts] Find an equation of a line parallel to $\vec{v} = 2\hat{i} + 3\hat{j} - \hat{k}$ that passes through the point $(0, 3, -1)$. Is the point $(2, 4, 0)$ on this line?

$$\langle 2, 3, -1 \rangle$$

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

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

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

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

The point $(2, 4, 0)$ is not on the line.