

Instructions: show all work. Use exact answers unless explicitly asked to do otherwise.

1. Suppose I have three points that define a plane. These points are (2,3,1), (-1,4,5) and (0,2,-6).
 a. Construct two vectors between the points in the plane.

$$\vec{AB} = \langle -3, 1, 4 \rangle$$

$$\vec{AC} = \langle -2, -1, -7 \rangle$$

$$\vec{BC} = \langle 1, -2, -11 \rangle$$

- b. Use the cross product to obtain a vector perpendicular to the plane.

$$\vec{AB} \times \vec{AC} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -3 & 1 & 4 \\ -2 & -1 & -7 \end{vmatrix} = (-7+4)\hat{i} - (21+8)\hat{j} + (3+2)\hat{k} \\ -3\hat{i} + (-29)\hat{j} + 5\hat{k}$$

- c. Use the vector obtained in part (b) together with one of the points to obtain an equation for the plane.

$$-3(x-2) - 29(y-3) + 5(z-1) = 0$$

- d. What is the equation of the line through the points (2,3,1) and (-1,4,5) in parametric form?
A B

$$\vec{r}(t) = (-3t+2)\hat{i} + (t+3)\hat{j} + (4t+1)\hat{k}$$

or

$$\vec{r}(t) = (-3t-1)\hat{i} + (t+4)\hat{j} + (4t+5)\hat{k}$$