

$$2. a) \overrightarrow{AB} = \begin{bmatrix} -2-1 \\ 2-(-1) \\ 2-2 \end{bmatrix} = \begin{bmatrix} -3 \\ 3 \\ 0 \end{bmatrix}$$

$$\overrightarrow{AC} = \begin{bmatrix} -1-1 \\ 0-(-1) \\ 1-2 \end{bmatrix} = \begin{bmatrix} -2 \\ 1 \\ -1 \end{bmatrix}$$

$$\begin{aligned} \underline{n} &= \overrightarrow{AB} \times \overrightarrow{AC} = \begin{vmatrix} 3 & 1 \\ 0 & -1 \end{vmatrix} \hat{i} - \begin{vmatrix} -3 & -2 \\ 0 & -1 \end{vmatrix} \hat{j} + \begin{vmatrix} -3 & -2 \\ 3 & 1 \end{vmatrix} \hat{k} \\ &= -3\hat{i} - 3\hat{j} + 3\hat{k} \\ &= \begin{bmatrix} -3 \\ -3 \\ 3 \end{bmatrix} \end{aligned}$$

The equation of Π has the form

$$-3x - 3y + 3z = d$$

Using $C(-1, 0, 1)$ we have

$$\begin{aligned} -3(-1) - 3(0) + 3(1) &= d \\ 6 &= d \end{aligned}$$

and so Π has the equation

$$-3x - 3y + 3z = 6$$

$$\boxed{-x - y + z = 2}$$