Problem 1. Consider the following system of linear equations:

$$\begin{cases} x + 2y + 0 = -1 \\ x + 2y + z = 0 \\ x + 2y + 2z = 1 \end{cases}$$

(a) Put the system in reduced row echelon form (RREF).

(b) Use your answer from part (a) to write down the complete solution.

Let 
$$y = t$$
 be Free. Then
$$\begin{pmatrix} x \\ 5 \end{pmatrix} = \begin{pmatrix} -1 - 2t \\ t \end{pmatrix} = \begin{pmatrix} -1 \\ 0 \end{pmatrix} + t \begin{pmatrix} -2 \\ 1 \\ 0 \end{pmatrix},$$
This is the line containing

This is the line containing the point (-1,0,1) and parallel to the vector (-2,1,0).

Problem 2. Consider the same system of equations again:

$$\begin{cases} x + 2y + 0 = -1 \\ x + 2y + z = 0 \\ x + 2y + 2z = 1 \end{cases}$$



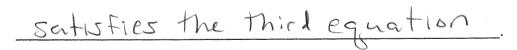
(a) The three linear equations represent three planes living in 3D. Tell me three vectors that are perpendicular to these three planes.

(b) Fill in the blanks. Let  $E_1, E_2, E_3$  represent the three linear equations. The reason that the solution is a line (instead of a point) is because there exists a non-trivial relation among the equations:

$$E_3 = \underbrace{\phantom{a}} \cdot E_1 + \underbrace{\phantom{a}} \cdot E_2$$

(c) Fill in the blanks. The equation from part (b) has the following consequences:

If the point (x, y, z) satisfies the first and second equations then it also



Geometrically, the intersection of the first and second planes is contained in

the third plane