1) [1.3 Q13] Determine if b is a linear combination of the vectors formed from the columns of the matrix A.

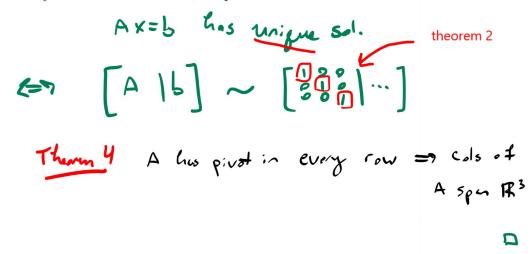
$$A = \begin{bmatrix} 1 & -4 & 2 \\ 0 & 3 & 5 \\ -2 & 8 & -4 \end{bmatrix}, b = \begin{bmatrix} 3 \\ -7 \\ -3 \end{bmatrix}$$

$$\begin{bmatrix} 1 & -4 & 2 \\ 0 & 3 & 5 \\ -2 & 8 & -4 \end{bmatrix} \xrightarrow{R3L_3R3t2R1} \begin{bmatrix} 1 & -4 & 2 & 3 \\ 0 & 3 & 5 & -7 \\ 0 & 0 & 5 & 3 \end{bmatrix} \xrightarrow{R2L_3R3} \begin{bmatrix} 1 & -4 & 2 & 3 \\ 0 & 3 & 5 & -7 \\ 0 & 0 & 5 & 3 \end{bmatrix} \xrightarrow{R2L_3R3} \begin{bmatrix} 1 & -4 & 2 & 3 \\ 0 & 1 & 5/3 & -7/3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$\sim \begin{bmatrix} 1 & 0 & 2t & 2t/3 \\ 0 & 1 & 5/3 & -7/3 \\ 0 & 0 & 0 & 1 \end{bmatrix} \xrightarrow{Tr(cons:start)} (Thurs 2)$$

2) [1.5 Q21] Describe and compare the solution sets of $x_1 + 9x_2 - 4x_3 = 0$ and $x_1 + 9x_2 - 4x_3 = -2$.

3) [1.4 Q44] Suppose A is a 3×3 matrix and b is a vector in \mathbb{R}^3 with the property that Ax = b has a unique solution. Explain why the columns of A must span \mathbb{R}^3 ?



4) [1.5 Q38] Suppose Ax = b has a solution. Explain why the solution is unique precisely when Ax = 0 has only the trivial solution.

Let
$$x_0$$
 be a solution to $Ax=b_0$ i.e. $Ax_0=b_0$

if $Ax_1 \neq x_0$ s.t. $Ax_1=b_0$, then $Ax_1-Ax_0=b_0=b_0$

Therm $a_1 \neq x_0$

$$A(x_1-x_0)=0$$

$$A(x_1-x_0$$