**Work each problem thoroughly showing all work.**

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1. Consider the system of equations below.

$$x_1 + 2x_2 + x_3 = 4$$
$$2x_1 + 4x_2 + 4x_3 + 8x_4 = 2$$
$$4x_1 + 8x_2 + 6x_3 + 8x_4 = 10$$

The matrices below represent $[A \ \mathbf{b}], [U \ \mathbf{c}]$ and $[R \ \mathbf{d}]$.

$$\begin{bmatrix} 1 & 2 & 1 & 0 & | & 4 \\ 2 & 4 & 4 & 8 & | & 2 \\ 4 & 8 & 6 & 8 & | & 10 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 1 & 0 & | & 4 \\ 0 & 0 & 2 & 8 & | & -6 \\ 0 & 0 & 0 & 0 & | & 0 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 0 & -4 & | & 7 \\ 0 & 0 & 1 & 4 & | & -3 \\ 0 & 0 & 0 & 0 & | & 0 \end{bmatrix}$$

Use this information to answer the questions that follow.

(a) Describe the column space, $C(A)$.

(b) Find the nullspace, $N(A)$.

(c) Find a particular solution $\vec{x}_p$.

(d) Find a complete solution to the system.