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Problem 1

$$\begin{bmatrix} 2 & 4 & -4 \\ 5 & 7 & 11 \end{bmatrix} = \begin{bmatrix} 1 & 2 & -2 \\ 5 & 7 & 11 \end{bmatrix} = \begin{bmatrix} 1 & 2 & -2 \\ 0 & -3 & 21 \end{bmatrix} = \begin{bmatrix} 1 & 2 & -2 \\ 0 & 1 & -7 \end{bmatrix} = \begin{bmatrix} 1 & 2 & -2 \\ 0 & 1 & -7 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 12 \\ 0 & 1 & -7 \end{bmatrix}$$

$$solution$$

$$x_1 = 12, x_2 = -7$$

Problem 2
The three planes intersect at the point (0, 0, 1)

Problem 3

$$\begin{bmatrix} 1 & h & -3 \\ -2 & 4 & 6 \end{bmatrix} = \begin{bmatrix} 1 & h & -3 \\ 1 & -2 & -3 \end{bmatrix}$$

$$h = -2$$

Problem 4

$$\begin{bmatrix} 1 & -3 & 8 & g \\ 0 & 4 & -15 & h \\ -3 & 5 & -9 & k \end{bmatrix} = \begin{bmatrix} 1 & -3 & 8 & g \\ 0 & 4 & -15 & h \\ 0 & -4 & 15 & 3g+k \end{bmatrix}$$

$$-h = 3g + k$$

$$3g + k + h = 0$$

Problem 5

In order for the system to be consistent for all values of f and g, a and c must have a common factor and b and d should share this common factor.

$$(e.g. a = 2, c = 4, b = 3, d = 6)$$

Problem 6

$$4T_1 - T_2 - T_4 = 30$$

$$-T_1 + 4T_2 - T_3 = 60$$

$$-T_2 + 4T_3 - T_4 = 70$$

$$-T_1 - T_2 + 4T_4 = 40$$

Gives us the augmented array

$$\begin{bmatrix} -1 & 0 & -1 & 4 & 40 \\ -1 & 4 & -1 & 0 & 60 \\ 0 & -1 & 4 & -1 & 70 \\ 4 & -1 & 0 & -1 & 30 \end{bmatrix}$$

Problem 7

$$\begin{bmatrix} -1 & 0 & -1 & 4 & 40 \\ -1 & 4 & -1 & 0 & 60 \\ 0 & -1 & 4 & -1 & 70 \\ 4 & -1 & 0 & -1 & 30 \end{bmatrix} \begin{bmatrix} 0 & -4 & 0 & 4 & -20 \\ -1 & 4 & -1 & 0 & 60 \\ 0 & -1 & 4 & -1 & 70 \\ 4 & 0 & -4 & 0 & -40 \end{bmatrix} \begin{bmatrix} 0 & -1 & 0 & 1 & -5 \\ -1 & 4 & -1 & 0 & 60 \\ 0 & -1 & 4 & -1 & 70 \\ 1 & 0 & -1 & 0 & -10 \end{bmatrix}$$

$$\begin{bmatrix} 0 & -1 & 0 & 1 & -5 \\ 0 & 4 & -2 & 0 & 50 \\ 0 & -2 & 4 & 0 & 65 \\ 1 & 0 & -1 & 0 & -10 \end{bmatrix} \begin{bmatrix} 0 & -1 & 0 & 1 & -5 \\ 0 & 0 & 6 & 0 & 180 \\ 0 & -2 & 4 & 0 & 65 \\ 1 & 0 & -1 & 0 & -10 \end{bmatrix} \begin{bmatrix} 0 & -1 & 0 & 1 & -5 \\ 0 & 0 & 1 & 0 & 30 \\ 0 & -2 & 4 & 0 & 65 \\ 1 & 0 & -1 & 0 & -10 \end{bmatrix}$$

$$\begin{bmatrix} 0 & -1 & 0 & 1 & -5 \\ 0 & 0 & 1 & 0 & 30 \\ 0 & -2 & 0 & 0 & -55 \\ 1 & 0 & 0 & 0 & 20 \end{bmatrix} \begin{bmatrix} 0 & -1 & 0 & 1 & -5 \\ 0 & 0 & 1 & 0 & 30 \\ 0 & 1 & 0 & 0 & -22.5 \\ 1 & 0 & 0 & 0 & 20 \end{bmatrix} \begin{bmatrix} 0 & 0 & 0 & 1 & 17.5 \\ 0 & 0 & 1 & 0 & 30 \\ 0 & 1 & 0 & 0 & -22.5 \\ 1 & 0 & 0 & 0 & 20 \end{bmatrix}$$

$$T_1 = 20$$

$$T_2 = 22.5$$

$$T_3 = 30$$

$$T_4 = 17.5$$