1. If $A = \begin{bmatrix} 1 & 2 & 0 \\ -2 & -1 & -2 \\ 0 & -1 & 1 \end{bmatrix}$ find A^{-1}

using A^{-1}, solve system of linear equations

$$x - 2y = 10$$
$$2x - y - z = 8$$
$$-2y + z = 7$$

$\Rightarrow$ $M_{11} = -3$ $M_{12} = -2$ $M_{13} = 2$

$M_{21} = 2$ $M_{22} = 1$ $M_{23} = -1$

$M_{31} = -4$ $M_{33} = -2$ $M_{33} = 3$

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$$\text{adj } A = \begin{bmatrix} -3 & -(-2) & 2 \\ -(2) & 1 & -(-1) \\ -4 & -(-2) & 3 \end{bmatrix}$$

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

$$|A| = 1(-3) - 2(-2) + 0 = 1$$

$$A^{-1} = \frac{(\text{adj } A)}{|A|} = \begin{bmatrix} -3 & -2 & -4 \\ 2 & 1 & 2 \\ 2 & 1 & 3 \end{bmatrix}$$

$$AX = B$$
$$X = A^{-1}B \quad \Rightarrow A = \begin{bmatrix} 1 & -2 & 0 \\ 2 & -1 & -1 \\ 0 & -2 & 1 \end{bmatrix} ; B = \begin{bmatrix} 10 \\ 8 \\ 7 \end{bmatrix}$$

$$X = \begin{bmatrix} -3 & -2 & -4 \\ 2 & 1 & 2 \\ 2 & 1 & 3 \end{bmatrix} \begin{bmatrix} 10 \\ 8 \\ 7 \end{bmatrix} = \begin{bmatrix} -30 + 16 + 14 \\ -20 + 8 + 7 \\ 40 + 16 + 21 \end{bmatrix} = \begin{bmatrix} 0 \\ -5 \\ -3 \end{bmatrix}$$

$$x = 0$$
$$y = -5$$
$$z = -3$$