Example 8: Let $A = \begin{bmatrix} -4 & 3 & 2 \\ 2 & -6 & 2 \\ 2 & 3 & -4 \end{bmatrix}$. If A is invertible, calculate A^{-1}. If not, explain why.

$$[A \mid I_3] = \left[\begin{array}{ccc|ccc} -4 & 3 & 2 & 1 & 0 & 0 \\ 2 & -6 & 2 & 0 & 1 & 0 \\ 2 & 3 & -4 & 0 & 0 & 1 \end{array}\right] \underset{R_1 \leftrightarrow R_2}{\sim} \left[\begin{array}{ccc|ccc} 2 & -6 & 2 & 0 & 1 & 0 \\ -4 & 3 & 2 & 1 & 0 & 0 \\ 2 & 3 & -4 & 0 & 0 & 1 \end{array}\right]$$

$$\underset{R_1 := \frac{1}{2} R_1}{\sim} \left[\begin{array}{ccc|ccc} 1 & -3 & 1 & 0 & \frac{1}{2} & 0 \\ -4 & 3 & 2 & 1 & 0 & 0 \\ 2 & 3 & -4 & 0 & 0 & 1 \end{array}\right] \underset{\substack{R_3 := R_3 - 2R_1 \\ R_2 := R_2 + 4R_1}}{\sim} \left[\begin{array}{ccc|ccc} 1 & -3 & 1 & 0 & \frac{1}{2} & 0 \\ 0 & -9 & 6 & 1 & 2 & 0 \\ 0 & 9 & -6 & 0 & -1 & 1 \end{array}\right]$$

$$\underset{R_3 := R_3 + R_2}{\sim} \left[\begin{array}{ccc|ccc} 1 & -3 & 1 & 0 & \frac{1}{2} & 0 \\ 0 & -9 & 6 & 1 & 2 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 \end{array}\right]$$

Not possible

Rank $(A) = 2 \neq n$

Thus A is not invertable by FTIM.