

Math 202 Quiz # 7-d

Name: _____ Section # _____ Serial # _____

Use Gauss-Jordan reduction method to solve the following system:

$$x_1 + x_2 + x_3 + x_4 = 0$$

$$x_1 + x_4 = 0$$

$$x_1 + 2x_2 + x_3 = 0$$

Solution:

$$\begin{bmatrix} 1 & 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 & | 0 \\ 1 & 2 & 1 & 0 & 0 \end{bmatrix}$$

$$\xrightarrow{\begin{matrix} -R_1+R_2 \\ -R_1+R_3 \end{matrix}} \begin{bmatrix} 1 & 1 & 1 & 1 & 0 \\ 0 & -1 & -1 & 0 & | 0 \\ 0 & 1 & 0 & -1 & 0 \end{bmatrix}$$

$$\xrightarrow{\begin{matrix} R_2+R_3 \\ -R_2 \end{matrix}} \begin{bmatrix} 1 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & | 0 \\ 0 & 0 & -1 & -1 & 0 \end{bmatrix}$$

$$\xrightarrow{\begin{matrix} -R_2+R_1 \\ -R_3 \end{matrix}} \begin{bmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & | 0 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix}$$

$$\xrightarrow{R_3+R_2} \begin{bmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & -1 & | 0 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix}$$

$$x_3 + x_4 = 0 \Rightarrow x_3 = -x_4$$

$$x_4 = t \Rightarrow x_3 = -t$$

$$x_2 - x_4 = 0 \Rightarrow x_2 = x_4 = t$$

$$x_1 + x_4 = 0 \Rightarrow x_1 = -x_4 = -t$$

\therefore the solution is $x_1 = -t, x_2 = t, x_3 = -t, x_4 = t$, where t is any real number.