VANDERBILT UNIVERSITY
MATH 196 — DIFFERENTIAL EQUATIONS WITH LINEAR ALGEBRA
EXAMPLES OF SECTIONS 3.2 AND 3.3.

Question 1. Use Gauss-Jordan elimination to solve the system:

$$\begin{cases} x + 3y + 2z = 2 \\ 2x + 7y + 7z = -1 \\ 2x + 5y + 2z = 7 \end{cases}$$

(this is the same system given as example of section 3.1; compare the method used here with the one previously employed).

SOLUTIONS.

1. The augmented matrix of the system is

$$\left[\begin{array}{ccc|c} 1 & 3 & 2 & 2 \\ 2 & 7 & 7 & -1 \\ 2 & 5 & 2 & 7 \end{array}\right]$$

Then

$$\left[\begin{array}{ccc|c} 1 & 3 & 2 & 2 \\ 2 & 7 & 7 & -1 \\ 2 & 5 & 2 & 7 \end{array}\right] \begin{array}{l} L_2 \leftarrow -2L_1 + L_2 \\ L_3 \leftarrow \underset{\sim}{-2L_1} + L_3 \end{array} \left[\begin{array}{ccc|c} 1 & 3 & 2 & 2 \\ 0 & 1 & 3 & -5 \\ 0 & -1 & -2 & 3 \end{array}\right]$$

$$L_3 \leftarrow \underset{\sim}{L_2} + L_3 \left[\begin{array}{ccc|c} 1 & 3 & 2 & 2 \\ 0 & 1 & 3 & -5 \\ 0 & 0 & 1 & -2 \end{array}\right] \begin{array}{l} L_2 \leftarrow -3L_3 + L_2 \\ L_1 \leftarrow \underset{\sim}{-2L_3} + L_1 \end{array} \left[\begin{array}{ccc|c} 1 & 3 & 0 & 6 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & -2 \end{array}\right]$$

$$L_1 \leftarrow \underset{\sim}{-3L_2} + L_1 \left[\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & -2 \end{array}\right]$$

Therefore the solution of the system is $x = 3$, $y = 1$, $z = -2$.