3.54

1 3.54(a), §1 Asked

Asked: Solve:

$$\left(\begin{array}{cc|c} 1 & -2 & 5 \\ 2 & 3 & 3 \\ 3 & 2 & 7 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2) \\ (3) \end{array}$$

2 3.54(a), §2 Solution

$$\left(\begin{array}{cc|c} \boxed{1} & -2 & 5 \\ 2 & 3 & 3 \\ 3 & 2 & 7 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2) \\ (3) \end{array}$$

Forward elimination:

$$\left(\begin{array}{cc|c} \boxed{1} & -2 & 5 \\ 0 & \boxed{7} & -7 \\ 0 & 8 & -8 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2') = (2) - 2(1) \\ (3') = (3) - 3(1) \end{array}$$

$$\left(\begin{array}{cc|c} \boxed{2} & 3 & 3 \\ 0 & \boxed{\text{-7}} & 7 \\ 0 & 0 & 0 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2') \\ (3'') = 7(3') - 8(2') \end{array}$$

Echelon form. *You must bring it completely to this form.*

Back substitution:

From $(3'')$, nothing; from $(2')$, $y = -1$; from (1), $x = 3$.

A unique solution.

3 3.54(b), §3 Asked

Asked: Solve:

$$\left(\begin{array}{cccc|c} 1 & 2 & -3 & 2 & 2 \\ 2 & 5 & -8 & 6 & 5 \\ 3 & 4 & -5 & 2 & 4 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2) \\ (3) \end{array}$$

4 3.54(b), §4 Solution

$$\left(\begin{array}{cccc|c} \boxed{1} & 2 & -3 & 2 & 2 \\ 2 & 5 & -8 & 6 & 5 \\ 3 & 4 & -5 & 2 & 4 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2) \\ (3) \end{array}$$

Forward elimination:

$$\left(\begin{array}{cccc|c} \boxed{1} & 2 & -3 & 2 & 2 \\ 0 & \boxed{1} & -2 & 2 & 1 \\ 0 & -2 & 4 & -4 & -2 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2') = (2) - 2(1) \\ (3') = (3) - 3(1) \end{array}$$

$$\left(\begin{array}{cccc|c} \boxed{1} & 2 & -3 & 2 & 2 \\ 0 & \boxed{1} & -2 & 2 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2') \\ (3'') = (3') + 2(2') \end{array}$$

Echelon form. *You must bring it completely to this form.*

Back substitution:

From $(3'')$, nothing; from $(2')$, $y = 1+2z-2t$; from (1), $x = 2-2(1+2z-2t)+3z-2t = -z+2t$.

Solution space is 2D.

5 3.54(c), §5 Asked

Asked: Solve (corrected):

$$\left(\begin{array}{cccc|c} 1 & 2 & 4 & -5 & 3 \\ 3 & -1 & 5 & 2 & 4 \\ 5 & -4 & 6 & 9 & 2 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2) \\ (3) \end{array}$$

6 3.54(c), §6 Solution

$$\left(\begin{array}{cccc|c} \boxed{1} & 2 & 4 & -5 & 3 \\ 3 & -1 & 5 & 2 & 4 \\ 5 & -4 & 6 & 9 & 2 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2) \\ (3) \end{array}$$

Forward elimination:

$$\left(\begin{array}{cccc|c} \boxed{1} & 2 & 4 & -5 & 3 \\ 0 & \boxed{-7} & -7 & 17 & -5 \\ 0 & -14 & -14 & 34 & -13 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2') = (2) - 3(1) \\ (3') = (3) - 5(1) \end{array}$$

$$\left(\begin{array}{cccc|c} \boxed{1} & 2 & -1 & 3 & 3 \\ 0 & \boxed{-7} & -7 & 17 & -5 \\ 0 & 0 & 0 & 0 & -3 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2') \\ (3'') = (3') - 2(2') \end{array}$$

Echelon form. *You must bring it completely to this form.*

Back substitution:

Equation $(3'')$ cannot be satisfied: there is no solution.