3.61(b)

1 3.61(b), §1 Asked

Given: A matrix

$$A = \begin{pmatrix} 1 & 2 & -1 & 2 & 1 \\ 2 & 4 & 1 & -2 & 3 \\ 3 & 6 & 3 & -7 & 7 \end{pmatrix} \qquad \begin{matrix}(1)\\(2)\\(3)\end{matrix}$$

Asked: Reduce the matrix to echelon and row canonical forms.

2 3.61(b), §2 Solution

$$A = \begin{pmatrix} \boxed{1} & 2 & -1 & 2 & 1 \\ 2 & 4 & 1 & -2 & 3 \\ 3 & 6 & 3 & -7 & 7 \end{pmatrix} \qquad \begin{matrix}(1)\\(2)\\(3)\end{matrix}$$

$$\begin{pmatrix} \boxed{1} & 2 & -1 & 2 & 1 \\ 0 & 0 & \boxed{3} & -6 & 1 \\ 0 & 0 & 6 & -13 & 4 \end{pmatrix} \qquad \begin{matrix}(1)\\(2') = (2) - 2(1)\\(3') = (3) - 3(1)\end{matrix}$$

$$\begin{pmatrix} \boxed{1} & 2 & -1 & 2 & 1 \\ 0 & 0 & \boxed{3} & -6 & 1 \\ 0 & 0 & 0 & \boxed{\text{-1}} & 2 \end{pmatrix} \qquad \begin{matrix}(1)\\(2')\\(3'') = (3') - 2(2')\end{matrix}$$

This is in echelon form.

$$\begin{pmatrix} \boxed{1} & 2 & -1 & 0 & 5 \\ 0 & 0 & \boxed{3} & 0 & -11 \\ 0 & 0 & 0 & \boxed{1} & -2 \end{pmatrix} \qquad \begin{matrix}(1') = (1) + 2(3'')\\(2'') = (2') - 6(3'')\\(3''') = -(3'')\end{matrix}$$

$$\begin{pmatrix} \boxed{1} & 2 & 0 & 0 & \frac{4}{3} \\ 0 & 0 & \boxed{1} & 0 & -\frac{11}{3} \\ 0 & 0 & 0 & \boxed{1} & -2 \end{pmatrix} \qquad \begin{matrix}(1'') = (1') + \frac{1}{3}(2'')\\(2''') = \frac{1}{3}(2'')\\(3''')\end{matrix}$$

This is row canonical form.