MATH 54 − SOLUTION TO 1.4.11

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The augmented matrix becomes:

$$\begin{bmatrix} 1 & 3 & -4 & -2 \\ 1 & 5 & 2 & 4 \\ -3 & -7 & 6 & 12 \end{bmatrix}$$

Now row-reduce: Subtract the first row from the second, and add 3 times the first row to the third:

$$\begin{bmatrix} 1 & 3 & -4 & -2 \\ 0 & 2 & 6 & 6 \\ 0 & 2 & -6 & 6 \end{bmatrix}$$

Divide the second row and the third row by 2:

$$\begin{bmatrix} 1 & 3 & -4 & -2 \\ 0 & 1 & 3 & 3 \\ 0 & 1 & -3 & 3 \end{bmatrix}$$

Subtract the second row from the third:

$$\begin{bmatrix} 1 & 3 & -4 & -2 \\ 0 & 1 & 3 & 3 \\ 0 & 0 & -6 & 0 \end{bmatrix}$$

Divide the third row by -6:

$$\begin{bmatrix} 1 & 3 & -4 & -2 \\ 0 & 1 & 3 & 3 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

Add 4 times the third row to the first, and subtract 3 times the third row from the second:

$$\begin{bmatrix} 1 & 3 & 0 & -2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

Subtract 3 times the second row from the first:

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$$\begin{bmatrix} 1 & 0 & 0 & -11 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

This gives us:

$$\begin{cases} x_1 = -11 \\ x_2 = 3 \\ x_3 = 0 \end{cases}$$

That is:

$$\mathbf{x} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} -11 \\ 3 \\ 0 \end{bmatrix}$$