## TWO FUNDAMENTAL QUESTIONS

*(1) Is the system consistent; that is, does a solution* ***exist****?*

*(2) If a solution exists, is it the only one; that is, is the solution* ***unique****?*

**EXAMPLE 2** Is this system consistent?

$$\begin{aligned} x_1 - 2x_2 + x_3 &= 0 \\ 2x_2 - 8x_3 &= 8 \\ -4x_1 + 5x_2 + 9x_3 &= -9 \end{aligned}$$

*Solution* In Example 1 we row reduced this system to the "triangular" form:

$$\begin{aligned} x_1 - 2x_2 + x_3 &= 0 \\ x_2 - 4x_3 &= 4 \\ x_3 &= 3 \end{aligned} \qquad \begin{bmatrix} 1 & -2 & 1 & 0 \\ 0 & 1 & -4 & 4 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

Now we can see that a solution exists and it is unique. (Why?)