

1.2 – Gaussian Elimination

7. Solve the system by Gaussian elimination.

$$x - y + 2z - w = -1$$

$$2x + y - 2z - 2w = -2$$

$$-x + 2y - 4z + w = 1$$

$$3x - 3w = -3$$

Row echelon form (#1-3 below) and **reduced row echelon form** (#1-4 below) of a matrix – to be of this form, a matrix must have the following properties:

1. If a row does not consist entirely of zeros, then the first nonzero number in the row is a 1. This is a **leading 1**.
2. If there are any rows that consist entirely of zeros, then they are grouped together at the bottom of the matrix.
3. In any two successive rows that do not consist entirely of zeros, the leading 1 in the lower row occurs farther to the right than the leading 1 in the higher row.
4. Each column that contains a leading 1 has zeros everywhere else in that column.

28. What condition, if any, must a , b , and c satisfy for the linear system to be consistent?

$$x + 3y + z = a$$

$$-x - 2y + z = b$$

$$3x + 7y - z = c$$

Solve the given linear system by any method.

16.

$$2x - y - 3z = 0$$

$$-x + 2y - 3z = 0$$

$$x + y + 4z = 0$$

19.

$$2x + 2y + 4z = 0$$

$$w - y - 3z = 0$$

$$2w + 3x + y + z = 0$$

$$-2w + x + 3y - 2z = 0$$

23. The augmented matrix for a linear system is given in which the asterisk represents an unspecified real number. Determine whether the system is consistent, and if so whether the solution is unique. Answer “inconclusive” if there is not enough information to make a decision.

a.
$$\begin{bmatrix} 1 & * & * & * \\ 0 & 1 & * & * \\ 0 & 0 & 1 & * \end{bmatrix}$$

b.
$$\begin{bmatrix} 1 & * & * & * \\ 0 & 1 & * & * \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

c.
$$\begin{bmatrix} 1 & * & * & * \\ 0 & 1 & * & * \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

d.
$$\begin{bmatrix} 1 & * & * & * \\ 0 & 0 & * & 0 \\ 0 & 0 & 1 & * \end{bmatrix}$$