

Solving a homogenous system of linear equations

Always write your solutions as a linear combination of fixed vectors. The row-equivalent matrix in row-echelon form is given, but you may check this by applying Gaussian elimination with partial pivoting.

1. Suppose you want to find all solutions to a given homogenous system of linear equations and you find

$$\left(\begin{array}{cc|c} -3.5 & -0.4 & 0 \\ 5 & 2 & 0 \end{array}\right) \sim \left(\begin{array}{cc|c} 5 & 2 & 0 \\ 0 & 1 & 0 \end{array}\right).$$

Find all solutions.

2. Suppose you want to find all solutions to a given homogenous system of linear equations and you find

$$\left(\begin{array}{cc|c} 1.2 & -1.8 & 0 \\ -4 & 6 & 0 \end{array}\right) \sim \left(\begin{array}{cc|c} -4 & 6 & 0 \\ 0 & 0 & 0 \end{array}\right).$$

Find all solutions.

3. Suppose you want to find all solutions to a given homogenous system of linear equations and you find

$$\left(\begin{array}{ccc|c} 0.1 & 4.2 & 1.7 & 0 \\ -0.9 & -3 & -2.9 & 0 \\ 1 & 2 & -3 & 0 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 2 & -3 & 0 \\ 0 & 4 & 2 & 0 \\ 0 & 0 & -5 & 0 \end{array}\right).$$

Find all solutions.

4. Suppose you want to find all solutions to a given homogenous system of linear equations and you find

$$\left(\begin{array}{ccc|c} -0.4 & -0.8 & 2.2 & 0 \\ 1 & 2 & -3 & 0 \\ 0.9 & 1.8 & -0.7 & 0 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 2 & -3 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right).$$

Find all solutions.

5. Suppose you want to find all solutions to a given homogenous system of linear equations and you find

$$\left(\begin{array}{cccc|c} 2.8 & -0.7 & -2.1 & -6.6 & 0 \\ 2 & -0.5 & 8.5 & 1 & 0 \\ 4 & -1 & 3 & -6 & 0 \end{array}\right) \sim \left(\begin{array}{cccc|c} 4 & -1 & 3 & -6 & 0 \\ 0 & 0 & 7 & 4 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right).$$

Find all solutions.

6. Suppose you want to find all solutions to a given homogenous system of linear equations and you find

$$\left(\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 1 & 1 & -1 & -1 & 0 \\ 1 & -1 & -1 & 1 & 0 \\ 1 & -1 & 1 & -1 & 0 \end{array}\right) \sim \left(\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 0 & -2 & -2 & 0 & 0 \\ 0 & 0 & -2 & -2 & 0 \\ 0 & 0 & 0 & -4 & 0 \end{array}\right).$$

Find all solutions.

7. Suppose you want to find all solutions to a given homogenous system of linear equations and you find

$$\left(\begin{array}{ccc|c} -0.9 & -0.2 & 0.7 & 0 \\ 2.7 & 3.8 & 5.9 & 0 \\ -2.1 & 0 & 2.8 & 0 \\ 3 & 2 & 1 & 0 \\ 0.3 & -0.4 & -1.4 & 0 \end{array} \right) \sim \left(\begin{array}{ccc|c} 3 & 2 & 1 & 0 \\ 0 & 2 & 5 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{array} \right).$$

Find all solutions.