

## Homework

Solve the system of linear equations

$$\begin{array}{l} \mathbf{1.} \quad \left\{ \begin{array}{l} x_1 - x_2 = 0 \\ 3x_1 - 2x_2 = -1 \end{array} \right. \\ \mathbf{2.} \quad \left\{ \begin{array}{l} 3x + 2y = 2 \\ 6x + 4y = 14 \end{array} \right. \\ \mathbf{3.} \quad \left\{ \begin{array}{l} 3x_1 - 2x_2 + 4x_3 = 1 \\ x_1 + x_2 - 2x_3 = 3 \\ 2x_1 - 3x_2 + 6x_3 = 8 \end{array} \right. \end{array}$$

Determine the size of the matrix

$$\begin{array}{l} \mathbf{4.} \quad \begin{bmatrix} 1 & 2 & -4 \\ 3 & 4 & 6 \\ 0 & 1 & 2 \end{bmatrix} \\ \mathbf{5.} \quad \begin{bmatrix} 2 & 1 & -1 & -1 \\ -6 & 2 & 0 & 1 \end{bmatrix} \end{array}$$

Find the solution set of the system of linear equations represented by the augmented matrix.

$$\begin{array}{l} \mathbf{6.} \quad \left[ \begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & -1 & 0 & 3 \\ 0 & 1 & 2 & 0 & 1 & -2 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 & -1 \end{array} \right] \\ \mathbf{7.} \quad \left[ \begin{array}{ccc|ccc} 1 & -1 & 0 & 1 & -1 & 0 & 3 \\ 0 & 1 & -2 & 0 & 1 & -2 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 & -1 \end{array} \right] \end{array}$$

8. Determine whether the matrix is in row-echelon form. If it is, determine whether it is also in reduced row-echelon form.

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

Solve the system using either Gaussian elimination or Gauss-Jordan elimination

$$\begin{array}{l} \mathbf{9.} \quad \left\{ \begin{array}{l} x_1 - 3x_3 = -2 \\ 3x_1 + x_2 - 2x_3 = 5 \\ 2x_1 + 2x_2 + x_3 = 4 \end{array} \right. \\ \mathbf{10.} \quad \left\{ \begin{array}{l} 2x_1 + 3x_3 = 3 \\ 4x_1 - 3x_2 + 7x_3 = 5 \\ 8x_1 - 9x_2 + 15x_3 = 10 \end{array} \right. \end{array}$$

11. Assume that the matrix is the augmented matrix of a system of linear equations, and

$$\left[ \begin{array}{ccc|ccc} 1 & k & 2 & 1 & -1 & 0 & 3 \\ -3 & 4 & 1 & 0 & 1 & -2 & 1 \end{array} \right]$$

- Determine the number of equations and the number of variables.
- Find the value(s) of  $k$  such that the system is consistent.
- Determine the number of equations and the number of variables but if the matrix is the coefficient matrix of a *homogeneous* system of linear equations.
- Find the value(s) of  $k$  from part (c).

Determine the polynomial function whose graph through the points and sketch the graph of the polynomial function, showing the points.

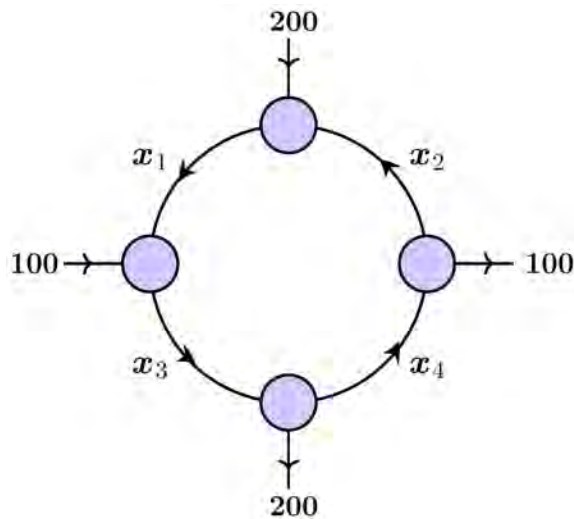
12.  $(2, 5), (3, 2), (4, 5)$

13.  $(2, 4), (3, 6), (5, 10)$

14.  $(-1, 3), (0, 0), (1, 1), (4, 58)$

15. The U.S. census lists the population of the United States as 249 million in 1990, 282 million in 2000, and 309 million in 2010. Fit a second-degree polynomial passing through these three points and use it to predict the populations in 2020 and 2030.

16. The flow of traffic, in vehicles per hour, through a network of streets as is shown below



a) Solve this system for  $x_i$ ,  $i = 1, 2, 3, 4$ .

b) Find the traffic flow when  $x_4 = 0$ .

c) Find the traffic flow when  $x_4 = 100$ .

d) Find the traffic flow when  $x_1 = 2x_2$ .