

## Problems of Systems of equations with matrices

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1) Discuss and solve the following system of linear equations:

$$\left. \begin{array}{l} 4x - 3y - 3z = -6 \\ 4x - 2y + 3z = -17 \\ 4x - 4y - 9z = 4 \end{array} \right\}$$

2) Discuss and solve the following system of linear equations:

$$\left. \begin{array}{l} 4x - 5y - 6z = 1 \\ x - y - 3z = 0 \\ 2x - y - 12z = -1 \end{array} \right\}$$

3) Discuss and solve the following system of linear equations:

$$\left. \begin{array}{l} 2x - 3y = -9 \\ x + 5y - 2z = 12 \\ 6x - y - z = 5 \end{array} \right\}$$

4) Discuss and solve the following system of linear equations:

$$\left. \begin{array}{l} 4x - z = 13 \\ 4x - 2y - z = 3 \\ 4y = 19 \end{array} \right\}$$

5) Discuss and solve the following system of linear equations:

$$\left. \begin{array}{l} 2x + y - 3z = 9 \\ 4x + y - 5z = 17 \\ 4x + 3y - 7z = 19 \end{array} \right\}$$

6) Discuss and solve the following system of linear equations:

$$\left. \begin{array}{l} x + 7y + 3z = 6 \\ 2x + 4y - z = 3 \\ 4x + y - 4z = -9 \end{array} \right\}$$

7) Discuss the following system of linear equations according to the values of parameter  $q$  and solve the system if possible.

$$\left. \begin{array}{l} 5x + 4y + qz = 0 \\ x + y + 4z = 1 \\ 3x + 2y + 4z = -2 \end{array} \right\}$$

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8) Discuss and solve the following system of linear equations according to the values of parameter  $a$ . Solve the system (if possible) when parameter is  $a = 4$ .

$$\left. \begin{array}{l} x - 3y - 3z = -19 \\ 6x + y + az = 12 \\ x + 3y + 3z = 17 \end{array} \right\}$$

9) Discuss the following system of linear equations according to the values of parameter  $k$  and solve the system if possible.

$$\left. \begin{array}{l} 3x - 2y - 4z = 2 \\ 3x + 5y - 5z = -2 \\ (k-5)y + 2z = 8 \end{array} \right\}$$

10) Discuss and solve the following system of linear equations according to the values of parameter  $m$ . Solve the system (if possible) when parameter is  $m = 1$ .

$$\left. \begin{array}{l} x + 3y + mz = 1 \\ x + 5y + 3z = 9 \\ x + 4y + z = -1 \end{array} \right\}$$

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**Answers:**

- 1) Incompatible (contradictory) system
- 2) Compatible indeterminated system.  $x = 9\lambda - 1$ ,  $y = 6\lambda - 1$ ,  $z = \lambda$ ,  $\lambda \in \mathfrak{R}$
- 3) Compatible determinated system.  $x = 3$ ,  $y = 5$ ,  $z = 8$
- 4) Incompatible (contradictory) system
- 5) Compatible indeterminated system.  $x = \lambda + 4$ ,  $y = \lambda + 1$ ,  $z = \lambda$ ,  $\lambda \in \mathfrak{R}$
- 6) Compatible determinated system.  $x = -6$ ,  $y = 3$ ,  $z = -3$
- 7)  $q = 12$ : Compatible indeterminated system.  $x = 4\lambda - 4$ ,  $y = -8\lambda + 5$ ,  $z = \lambda$ ,  $\lambda \in \mathfrak{R}$ .  
 $q \neq 12$ : Compatible determinated system.  $x = -4$ ,  $y = 5$ ,  $z = 0$
- 8)  $a = 1 \rightarrow$  Incompatible (contradictory) system.  
 $a \neq 1 \rightarrow$  Compatible determinated system.  
 $a = 4 \rightarrow x = -1$ ,  $y = 2$ ,  $z = 4$
- 9)  $k = -9$ : Compatible indeterminated system.  $x = 10\lambda + 6$ ,  $y = \lambda$ ,  $z = 7\lambda + 4$ ,  $\lambda \in \mathfrak{R}$ .  
 $k \neq -9$ : Compatible determinated system.  $x = 6$ ,  $y = 0$ ,  $z = 4$
- 10)  $m = -1 \rightarrow$  Incompatible (contradictory) system.  
 $m \neq -1 \rightarrow$  Compatible determinated system.  
 $m = 1 \rightarrow x = 1$ ,  $y = -2$ ,  $z = 6$