

## Solution Sets of Linear Systems

1. Which of the following are solutions to the system of equations?

$$\begin{aligned}2x + y + 2z &= 0 \\ -x + 2y - 6z &= 0\end{aligned}$$

(a)  $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ 2 \\ 1 \end{bmatrix}$

(b)  $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -2 \\ -1 \end{bmatrix}$

(c)  $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -6 \\ 6 \\ 3 \end{bmatrix}$

(d)  $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ -4 \\ -2 \end{bmatrix}$

(e) None of the above.

(f) More than one of the above.

2. What is the solution to the following system of equations?

$$\begin{aligned}x + 2y + z &= 0 \\ x + 3y - 2z &= 0\end{aligned}$$

(a)  $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -7 \\ 3 \\ 1 \end{bmatrix} s$

(b)  $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 7 \\ -3 \\ 1 \end{bmatrix} s$

(c)  $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 7 \\ -3 \\ 0 \end{bmatrix}$

(d) 
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -7 \\ 3 \\ 0 \end{bmatrix}$$

(e) None of the above.

(f) More than one of the above.

3. What is the solution to the following system of equations?

$$\begin{aligned} x + 2y + z &= 3 \\ x + 3y - 2z &= 4 \end{aligned}$$

(a) 
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 7 \\ 3 \\ 0 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} s$$

(b) 
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -1 \\ -1 \\ 0 \end{bmatrix} + \begin{bmatrix} -7 \\ 3 \\ 1 \end{bmatrix} s$$

(c) 
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} + \begin{bmatrix} -7 \\ 3 \\ 1 \end{bmatrix} s$$

(d) None of the above.

(e) More than one of the above.

4. What is the solution to the following system of equations?

$$\begin{aligned} x + 2y + z &= -2 \\ x + 3y - 2z &= 1 \end{aligned}$$

(a) 
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -8 \\ 3 \\ 0 \end{bmatrix} + \begin{bmatrix} -7 \\ 3 \\ 1 \end{bmatrix} s$$

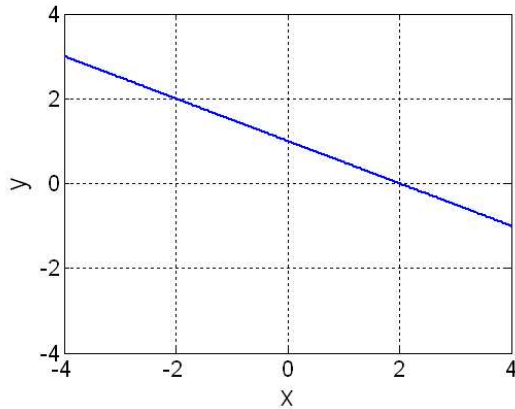
(b) 
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 8 \\ -3 \\ 0 \end{bmatrix} + \begin{bmatrix} -7 \\ 3 \\ 1 \end{bmatrix} s$$

(c) 
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -8 \\ 3 \\ 0 \end{bmatrix} + \begin{bmatrix} 7 \\ -3 \\ -1 \end{bmatrix} s$$

(d) None of the above.

(e) More than one of the above.

5. The set of solutions to a system of linear equations is plotted below. Which of the following expressions represents this solution set?



- (a)  $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix} + \begin{bmatrix} 1 \\ -1/2 \end{bmatrix} s$
- (b)  $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix} + \begin{bmatrix} -1/2 \\ 2 \end{bmatrix} s$
- (c)  $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} + \begin{bmatrix} -1/2 \\ 2 \end{bmatrix} s$
- (d)  $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 2 \end{bmatrix} + \begin{bmatrix} 1 \\ -2 \end{bmatrix} s$
- (e) None of the above.
- (f) More than one of the above.

6. The set of solutions to a linear system are represented by the expression below. How can we geometrically represent this solution set?

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 8 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} -7 \\ 1 \\ 0 \end{bmatrix} s + \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix} t$$

- (a) As a line in  $\mathfrak{R}^2$
- (b) As a line in  $\mathfrak{R}^3$
- (c) As a plane in  $\mathfrak{R}^3$
- (d) As a volume in  $\mathfrak{R}^3$
- (e) None of the above

7. Let  $R = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 2 \end{bmatrix}$ . If  $R$  is the reduced row echelon form of the augmented matrix for the system  $Ax = b$ , what are the solutions to that system?

- (a)  $x_1 = 1, x_2 = 1,$  and  $x_3 = 2$
- (b)  $x_1 = 1, x_2 = 1, x_3 = 2,$  and  $x_4 = 0$
- (c)  $x_1 = -t, x_2 = -t, x_3 = -2t,$  and  $x_4 = t$
- (d) There are no solutions to this system.

8. Let  $R = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 2 \end{bmatrix}$ . If  $R$  is the reduced row echelon form of the coefficient matrix for the system  $Ax = 0$ , what are the solutions to that system?

- (a)  $x_1 = 1, x_2 = 1,$  and  $x_3 = 2$
- (b)  $x_1 = 1, x_2 = 1, x_3 = 2,$  and  $x_4 = 0$
- (c)  $x_1 = -t, x_2 = -t, x_3 = -2t,$  and  $x_4 = t$
- (d) There are no solutions to this system.

9. Let matrix  $R$  be the reduced row echelon form of matrix  $A$ . **True or False** The solutions to  $Rx = 0$  are the same as the solutions to  $Ax = 0$ .

10. Let matrix  $R$  be the reduced row echelon form of matrix  $A$ . **True or False** The solutions to  $Rx = b$  are the same as the solutions to  $Ax = b$ .