Linear Systems: Vectors Tutorial

Vectors

1. Which of the following sets for a vector space?

   (a) $\{x \,|\, x \in \mathbb{R}\}$

   (b) $\left\{ \begin{bmatrix} x_1 \\ x_1 \end{bmatrix} \,\middle|\, x_1 \in \mathbb{R} \right\}$

   (c) $\left\{ \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \,\middle|\, x_1 + x_2 = 1,\ x_1, x_2 \in \mathbb{R} \right\}$

   (d) $\left\{ \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \,\middle|\, x_1 + x_2 = 0,\ x_1, x_2 \in \mathbb{R} \right\}$

   (e) $\left\{ \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \,\middle|\, x_1 + x_2 = 0,\ x_1, x_2 \in \mathbb{R} \right\}$

   (f) $\left\{ \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \,\middle|\, x_1, x_2 > 0,\ x_1, x_2 \in \mathbb{R} \right\}$

   (g) $\left\{ \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \,\middle|\, x_2 = x_1^2,\ x_1, x_2 \in \mathbb{R} \right\}$

   (h) $\left\{ \begin{bmatrix} x_1 \\ m \cdot x_1 \end{bmatrix} \,\middle|\, x_1 \in \mathbb{R} \right\}$

   (i) $\left\{ \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \,\middle|\, 2 \cdot x_1 - 3 \cdot x_2 + x_3 = 0,\ x_1, x_2, x_3 \in \mathbb{R} \right\}$

   (j) $\left\{ \alpha_1 \begin{bmatrix} 2 \\ 1 \\ -2 \end{bmatrix} + \alpha_2 \begin{bmatrix} -1 \\ 0 \\ 11 \end{bmatrix} \,\middle|\, \alpha_1, \alpha_2 \in \mathbb{R} \right\}$