

Matrix Algebra

\mathbb{R}^n

Extra Homework 1

1. Let $\mathbf{x} = \begin{pmatrix} -1 \\ -2 \\ -3 \end{pmatrix}$ and $\mathbf{y} = \begin{pmatrix} 4 \\ 5 \\ -2 \end{pmatrix}$. Evaluate
 - a) $\mathbf{x} + \mathbf{y}$
 - b) $8\mathbf{x}$
 - c) $3\mathbf{x} - 2\mathbf{y}$
 - d) $\mathbf{x} \cdot \mathbf{y}$
 - e) $\|\mathbf{x}\|$
2. Let $\mathbf{x} = \begin{pmatrix} 2 \\ -4 \\ 1 \end{pmatrix}$ and $\mathbf{y} = \begin{pmatrix} 9 \\ 0 \\ 2 \end{pmatrix}$. Evaluate
 - a) $\mathbf{x} + \mathbf{y}$
 - b) $-3\mathbf{y}$
 - c) $5\mathbf{x} + 4\mathbf{y}$
 - d) $\mathbf{x} \cdot \mathbf{y}$
 - e) $\|\mathbf{x}\|$
3. Which of the following are subspaces of \mathbb{R}^3 ? (For the ones which aren't subspaces, explain why they aren't.)
 - a) The set of $\begin{pmatrix} x \\ z \\ 0 \end{pmatrix}$ where x and z can be anything.
 - b) The set of $\begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix}$.
 - c) The set of $\begin{pmatrix} x \\ y \\ z \end{pmatrix}$ with $x + 2y + 3z = 0$ and $x - y - z = 0$.
 - d) The set of $\begin{pmatrix} x \\ y \\ z \end{pmatrix}$ with $x + yz = 0$.
 - e) The set of $\begin{pmatrix} x \\ y \\ z \end{pmatrix}$ with $2x - y + 5z = 0$.
 - f) The set of $\begin{pmatrix} x \\ y \\ z \end{pmatrix}$ with $xy = 0$.
4. Which of the following are subspaces of \mathbb{R}^4 ? (For the ones which aren't subspaces, explain why they aren't.)
 - a) The set of $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}$ where $x_1 - x_2 + x_3x_4 = 0$.
 - b) The set of $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}$ where $x_2 + x_3 + x_4 = 0$.
 - c) The set of $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}$ with $x_1 = 0$ and $x_2 - x_4 = 0$.
 - d) The set of $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}$ with $x_1 = x_2$ and $x_3 = x_4$.
 - e) The set of $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}$ with $x_1 + 2x_2 + 3x_3 + 4x_4 = 0$.
 - f) The set of $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}$ with $x_1x_2 + x_3 + x_4 = 0$.