

Homework 2

MATH 120

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1. Find the Frobenius norm of the matrix $\begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$.
2. Find the matrix norm compatible with the standard vector norm of $\begin{pmatrix} 2 & 3 \\ 3 & 2 \end{pmatrix}$.
3. Problem 3.15 on page 37.
4. Problem 3.16 on page 37.
5. Find the hyperplane with normal vector $(1, 4, -1, 2)^T$ and containing the point $(2, 0, -3, 7)$.
6. Find the dimension of the linear variety $\{\mathbf{x} \in \mathbb{R}^5 \mid A\mathbf{x} = \mathbf{b}\}$ where

$$A = \begin{pmatrix} 2 & 0 & -1 & 3 & 5 \\ 3 & -2 & 0 & 2 & -1 \\ 1 & 1 & 2 & 0 & -3 \end{pmatrix}$$

and $\mathbf{b} = (2, -3, 8)^T$.

7. Find an example of two convex sets such that the union of the two is not a convex set.
8. Problem 4.2 on page 47.
9. Problem 4.4 on page 47.
10. Is the polytope defined by the intersection of the following half spaces

$$H_1 = \{x \geq 0\}$$

$$H_2 = \{y \geq 0\}$$

$$H_3 = \{z \geq 0\}$$

$$H_4 = \{x + y + z \leq 1\}$$

a polyhedron, why or why not?

11. If H_4 above was replaced with $H_5 = \{y + z \leq 1\}$, is the polytope defined by the intersection of H_1, H_2, H_3 and H_5 a polyhedron, why or why not?