

First name: Harald
Last name: Röck
Date: 18. Dezember 2002
Homework number: 2
Homework Title: Exercise 2.33

Problem description:

Prove or give a counterexample:

If \mathbf{A} is a nonsingular matrix, then $\|\mathbf{A}^{-1}\| = \|\mathbf{A}\|^{-1}$

Problem solution:

If $\|\mathbf{A}^{-1}\| = \|\mathbf{A}\|^{-1}$ then $\|\mathbf{A}^{-1}\| \cdot \|\mathbf{A}\| = 1$. From that, each condition number must be 1.

The counterexample is Example 2.4 and 2.5.

$$\mathbf{A} = \begin{bmatrix} 2 & -1 & 1 \\ 1 & 0 & 1 \\ 3 & -1 & 4 \end{bmatrix}$$

Results

(compare with Example 2.4 and 2.5)

$$\|\mathbf{A}\|_1 = 6 ; \|\mathbf{A}^{-1}\|_1 = 4.5 \Rightarrow 1/6 \neq 4.5$$