

Numerical Analysis

MAT 542 – FALL 2010

Homework # 1 Due August 27

1. Find $\|\cdot\|_\infty$, $\|\cdot\|_2$ and $\|\cdot\|_1$ for the following vectors:

(a) $x = \left[3, -4, 0, \frac{3}{2}\right]^T$

(b) $x = \left[\sin k, \cos k, 2^k\right]^T$ for a fixed positive integer k .

2. Find $\|\cdot\|_\infty$ and $\|\cdot\|_1$ for the following matrix:

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

3. The following linear system $Ax = b$ has x as the actual solution and \tilde{x} as an approximate solution. Compute $\|x - \tilde{x}\|_\infty$ and $\|A\tilde{x} - b\|_\infty$.

$$\begin{cases} \frac{1}{2}x_1 + \frac{1}{3}x_2 = \frac{1}{63} \\ \frac{1}{3}x_1 + \frac{1}{4}x_2 = \frac{1}{168} \end{cases}$$

$$x = \left[\frac{1}{7}, -\frac{1}{6}\right]^T, \quad \tilde{x} = [0.142, -0.166]^T.$$