Numerical Methods I – Lab 4

Fall Semester 2005

October 4, 2005

Let

$$A = \begin{pmatrix} \varepsilon & 1 \\ 1 & 1 \end{pmatrix}, \qquad \boldsymbol{b} = \begin{pmatrix} 1+\varepsilon \\ 2 \end{pmatrix},$$

so that the exact solution to the linear system $A\boldsymbol{x} = \boldsymbol{b}$ is

$$\boldsymbol{x} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}.$$

1. Use Octave to compute the condition number of A with respect to a matrix norm of your choice for ε small.

   Hint: `help norm`; `help inv`

2. Solve this equation using Octave via its LU decomposition for $\varepsilon = 10^{-k}$ for $k = 2, \ldots, 18$.

   Hint: `help logspace`

3. Divide the first equation by ε. Does the accuracy improve? Does the condition number improve? Will pivoting help?