

Practice problems

1. Assume that we do the following operations in Matlab. Give an upper bound for the relative error of the computed result.

(a) $y = 1000.2 - 1000.1$

(b) $y = \exp(.001) - 1$

(c) How can we get a more accurate result for (b)?

2. Consider the matrix $A = \begin{pmatrix} 1 & 2 & 4 \\ 2 & 1 & 4 \\ 4 & 1 & 2 \end{pmatrix}$,

(a) Apply Gaussian elimination using the pivot candidate with the largest absolute value to find the matrices L, U and the vector p .

(b) Rearrange the rows of the matrix L to obtain L_1 with $L_1 U = A$.

(c) Using L, U, p solve the linear system $Ax = \begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix}$.

(d) We want to solve $Ax = b$. But we only have an approximate vector \tilde{b} with $\left| \frac{\tilde{b}_j - b_j}{b_j} \right| \leq .01$ and solve the linear system $A\tilde{x} = \tilde{b}$. What can you say about $\frac{\|\tilde{x} - x\|_\infty}{\|x\|_\infty}$ if $\|A^{-1}\|_\infty \leq 2.5$?