

## 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  $\|A^{-1}\|_\infty \leq 2.5$ ?