

The final exam is Monday 22 November 12:20-2:20 in our regular classroom.

The exam will consist of:

- A couple of questions directly from the first and second tests.
- Questions similar to the sample questions below.
- An open-book, open-internet, open-ended question related to computing the inverse of a matrix.

Here are some sample questions on the material after test 2.

1. Let

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

- (a) Use Gaussian elimination without pivoting to factor $A = LU$.
 (b) Use your LU factorization to solve

$$Ax = \begin{bmatrix} 6 \\ 8 \\ 0 \end{bmatrix}.$$

2. Consider the linear system $A\mathbf{x} = \mathbf{b}$ given by

$$\begin{bmatrix} 1 & 2 \\ 1.0001 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 3 \\ 3.0001 \end{bmatrix}.$$

- (a) Find the condition number of A using $\|\cdot\|_\infty$.
 (b) If we make a small error in A , we may have the system

$$\begin{bmatrix} 1 & 2 \\ 0.9999 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 3 \\ 3.0001 \end{bmatrix}.$$

Solve this system using five digit rounding, and see what error in \mathbf{x} was caused by the small error in A .

- (c) If we make a small error in \mathbf{b} , we may have the system

$$\begin{bmatrix} 1 & 2 \\ 1.0001 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 3 \\ 3.0002 \end{bmatrix}.$$

Solve this system using five digit rounding, and see what error in \mathbf{x} was caused by the small error in \mathbf{b} .