

031051S Numerical Matrix Analysis, the 1st partial exam.

For full credit, give enough details!

1. Let $A = \begin{bmatrix} 4 & 2 \\ 0 & -4 \end{bmatrix}$. Factor A into the product of two symmetric matrices. How many such factorizations of A are there?

2. Let $A = \begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix}$. Find a polynomial q such that $A^{-1} = q(A)$.

3. Let $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 0 \end{bmatrix}$. Compute the U and P factors of the partially pivoted LU factorization of A .

4. a) With the Fourier matrix F_4 , explain what is the factorization that the FFT relies on.

b) Let

$$C = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}.$$

By using F_4 , determine the eigenvalues of C .