Exercise 2.1
Given the matrix

$$A = \begin{pmatrix} 0 & 2 & 0 \\ 3 & 4 & 1 \\ 0 & 0 & 1 \end{pmatrix}$$

a) Confirm A has no LU factorization
b) permutate the matrix and compute LU

Exercise 2.2

$$f(x) = x^2 + 3x - 4 \text{ (or } x^2 + 4x - 4)$$

a) use fixed-point iteration, converges at $x_0 = 1$ to $x_* = 1$?
b) use newton method to compute x_1, x_2 at $x_0 = 1$ (or 0)

Exercise 2.3
Eigenvalue algorithm: Choose an algorithm of your choice for a given problem and explain why you chose that algorithm (e.g. choose rayleigh and describe all advantages and disadvantages, and write down the algorithm).

Exercise 2.4
Least-squares for the problem:

$$\begin{pmatrix} 1 & 1 \\ 2 & 0 \\ 0 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ -5 \end{pmatrix}$$

Exercise 2.5 **Theory**

SVD was one big questions: What is SVD and when do we need it, what are the individual matrices and elements, how are they related? (e.g. the individual σ_i^2 are the eigenvalues of $A^T A$, the columns of U contain the left singular vectors, the columns of V contain the right singular vectors, σ_r gives the rank of A, etc.).

The rest of the theory questions were half complexity/convergence rate questions.