Exercise 3 – Second-order and direct methods

The test function for this exercise will be the Rosenbrock function:

$$f(x) = (a - x_1)^2 + b(x_2 - x_1^2)^2,$$

with $a = 1$ and $b = 5$.

Your job is to program four methods for optimization of the Rosenbrock function, namely:

- Cyclic coordinate search with acceleration and optimal stepsize, $\Delta = $1e-4.

- Hooke-Jeeves method, $\alpha = 1, \varepsilon = $1e-6.

- Nelder-Mead method, $\Delta = $1e-6 and with the initial simplex $S = \begin{bmatrix} -1 & -0.8 & -0.5 \\ -1 & -0.8 & -1 \end{bmatrix}$.

- Quasi-newton method with optimal stepsize and the DFP equation for Q, termination when $\nabla f(x) < $1e-2.

As the starting point set $x^{(0)} = [-1, -1]^T$ (in the Nelder-Mead method, this is the first vertex of the simplex) and set the termination criteria (apart from the ones present in the methods) as both maximum number of iterations (max 100) and maximum function calls (max 1000). Visualize the trajectories of the iterations.