

MTH 464/564: Homework # 3, due 11/16/2022

To receive full credit, present complete answers that show all work.

Task 1 (25 points) Write a program that implements the Fletcher-Reeves nonlinear conjugate gradient method (see the lecture notes). Your code should implement a restart procedure, $\mathbf{p}_{k+1} = -\nabla f_{k+1}$, whenever the newly generated direction \mathbf{p}_{k+1} fails to be a descent direction. Implement a backtracking line search to determine α using an initial step length $\alpha_0 = 1$, and parameters $\rho = 0.5, c = 0.01$ (same setup as in HW #2). Provide a listing (printout) of your code.

Task 2 (25 points) Test your code on the Rosenbrock function using the same setup as in Task 2 of HW #2. For each set of experiments ($A=1$ & $A=100$) provide

- The approximate solution, the number of iterations and the number of function evaluations, restarts required (if any)
- Graphs showing the evolution of the cost function and the norm of the gradient during the optimization process