TPG4155 Computer Methods in Engineering
Exercise 1

Problem 1

A company is looking at a reservoir geometry and has decided that the best locations to place CO2 injectors named A, B, C, D and E are at the coordinates (10, 10), (30, 50), (16.667, 29), (0.555, 29.888) and (22.2221, 49.988), respectively, in the xy-plane. The company also needs a central platform to run the injectors from. It is anticipated that during an average week the total volume pumped through each injector pipeline will be 10, 18, 20, 14, and 25 (arbitrary units) for injectors A, B, C, D, and E, respectively. Longer pipelines require more powerful compressors in order to compensate for friction loss in the pipes. The company therefore wants to minimize the total distance-volume (distance from platform to injector multiplied by volume).

a) To accomplish this, where in the xy-plane should the platform be located? Use the steepest descent method. Visually verify that your solution is correct by plotting the function.

b) Use the Nelder-Mead algorithm to solve the same problem. Compare the two solutions (number of iterations, number of objective function evaluations, run time, accuracy, etc.).