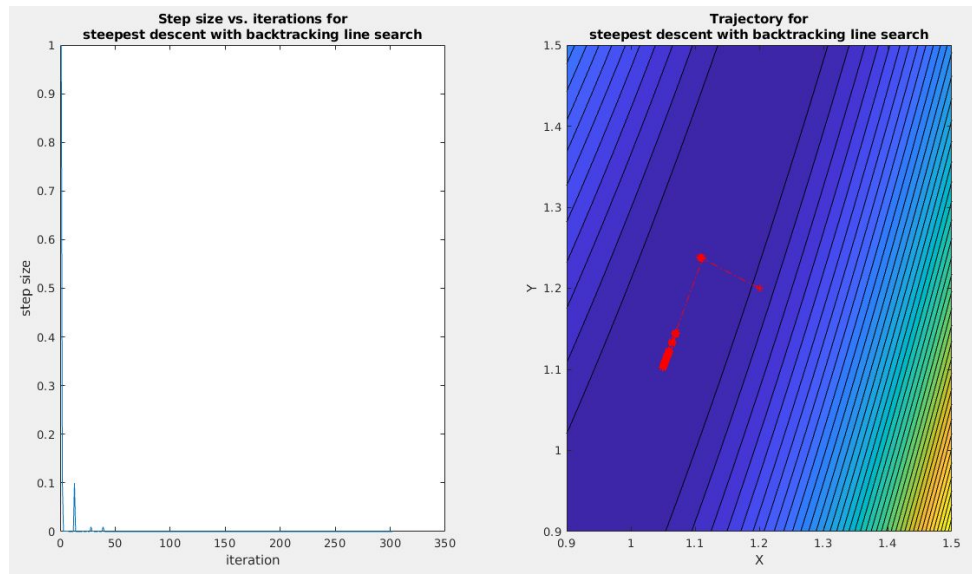


Numerical Optimisation Assignment 2

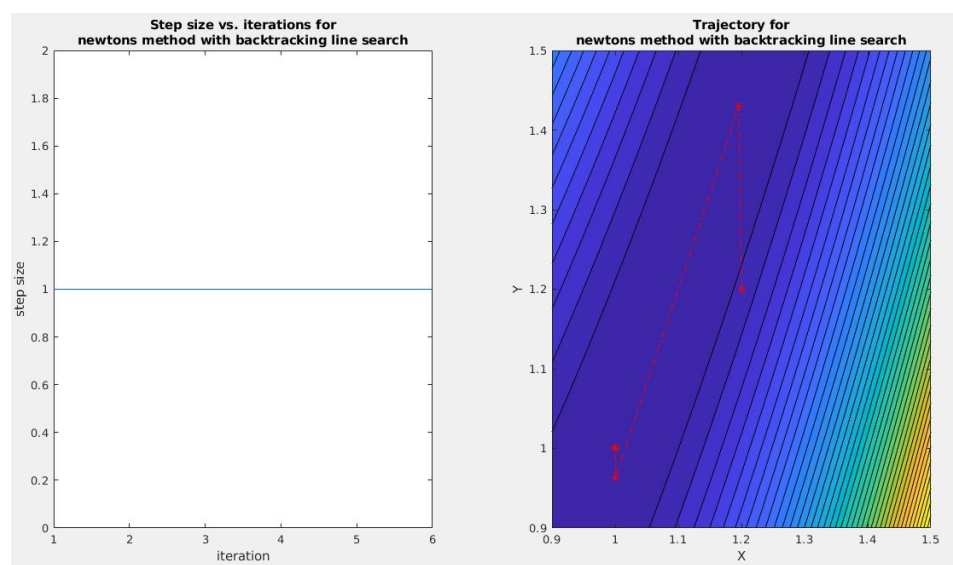
Keshav Iyengar
ucabkki

Exercise 1

B)

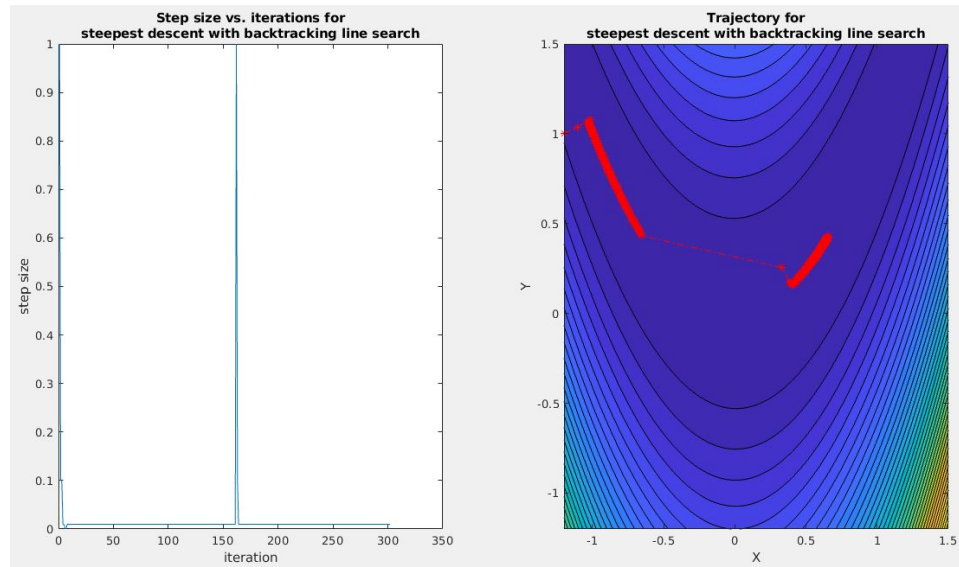


Starting point is (1.2,1.2). The direction chosen at each step is the steepest direction (negative gradient) and the step size is determined by backtracking line search, hence we see large steps even near convergence when compared to the other line search algorithms. Also takes more iterations to converge.

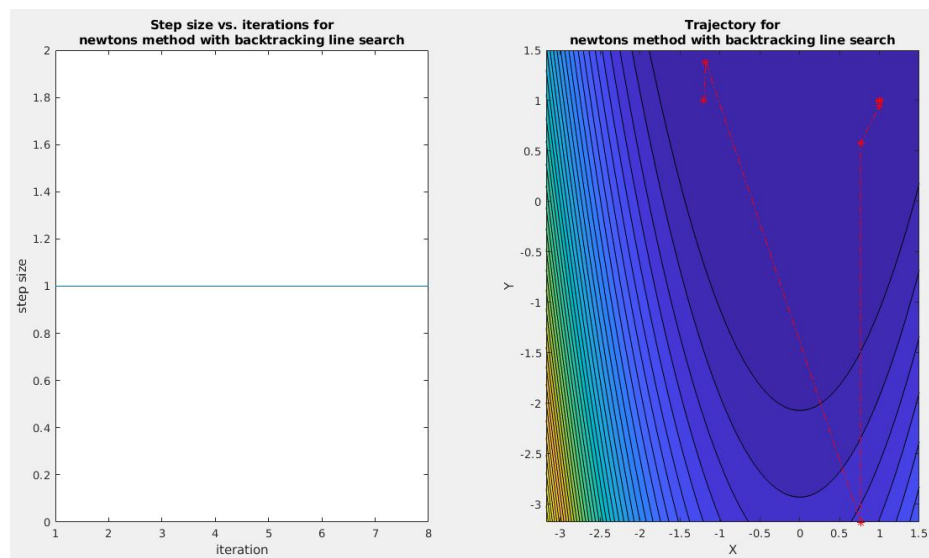


Starting point is $(1.2, 1.2)$. Newton's method is dependant on the both the Hessian and gradient, and converges rather quickly as shown. The direction is very different from the steepest descent algorithm because the hessian is used.

C)

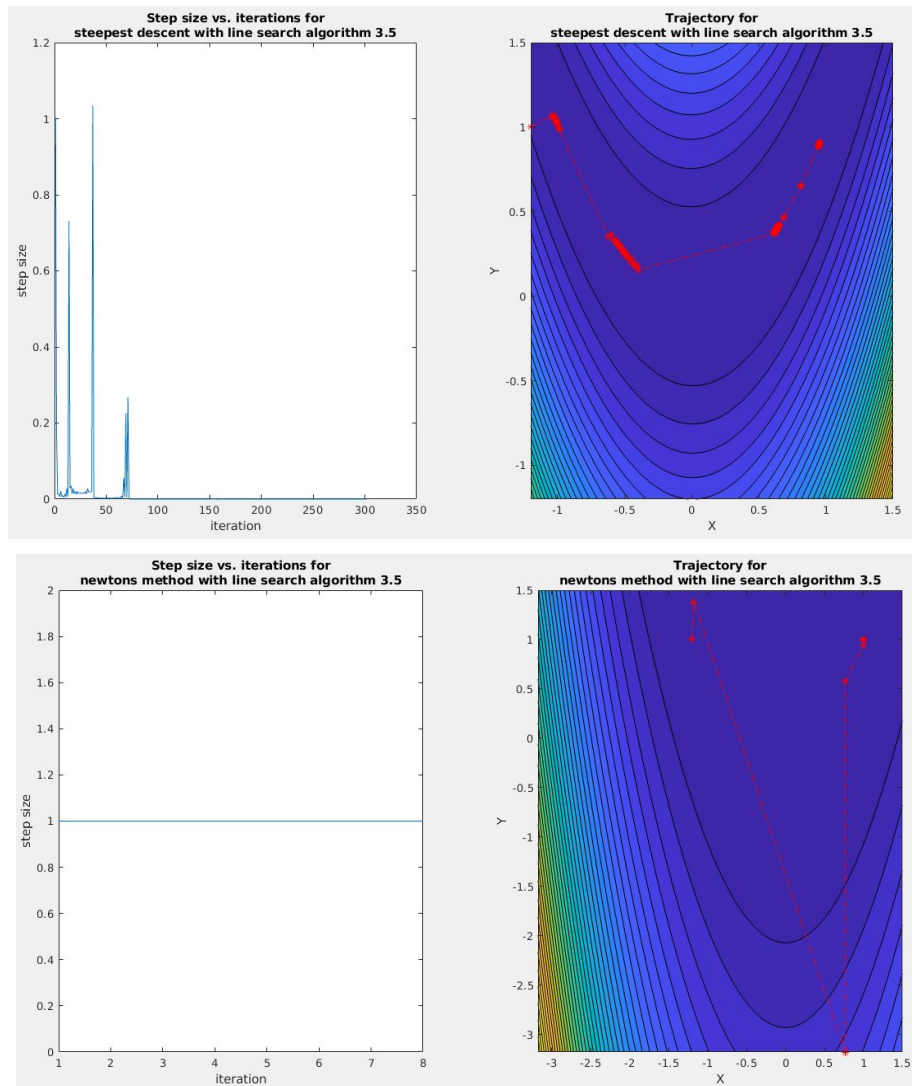


Starting point is $(-1.2, 1)$. With the steepest descent method, there are many iterations and many small steps with a large step in between. This is because the gradient becomes large in certain steps, requiring this large step.



Starting point is $(-1, 1.2)$. With the Newton method there are far fewer iterations. The step 3rd step out is due to the Hessian multiplied by the gradient and the nature of the Rosenbrock function.

D)



Comparing the steps of the backtracking line search with the 3.5 Algorithm line search (strong Wolfe Conditions), newton's method is identical due to the step size being fixed. However for steepest descent, where the step size plays an important role, the number of steps reduces and more frequent large steps are taken.