Convex Optimizations – Homework 3
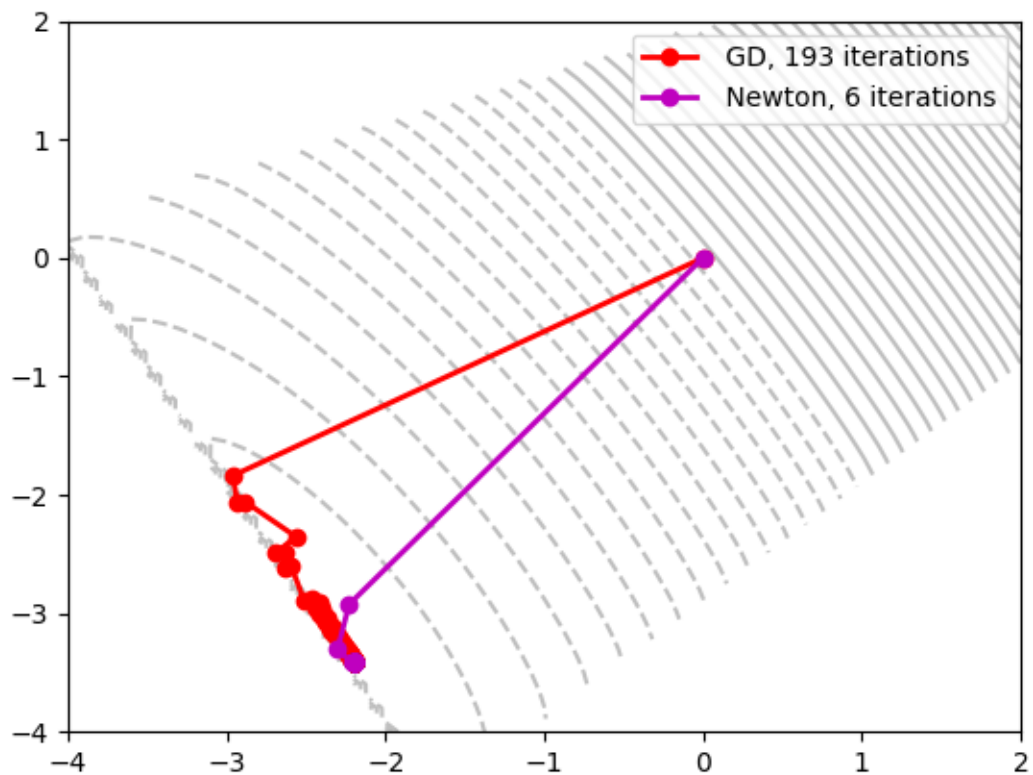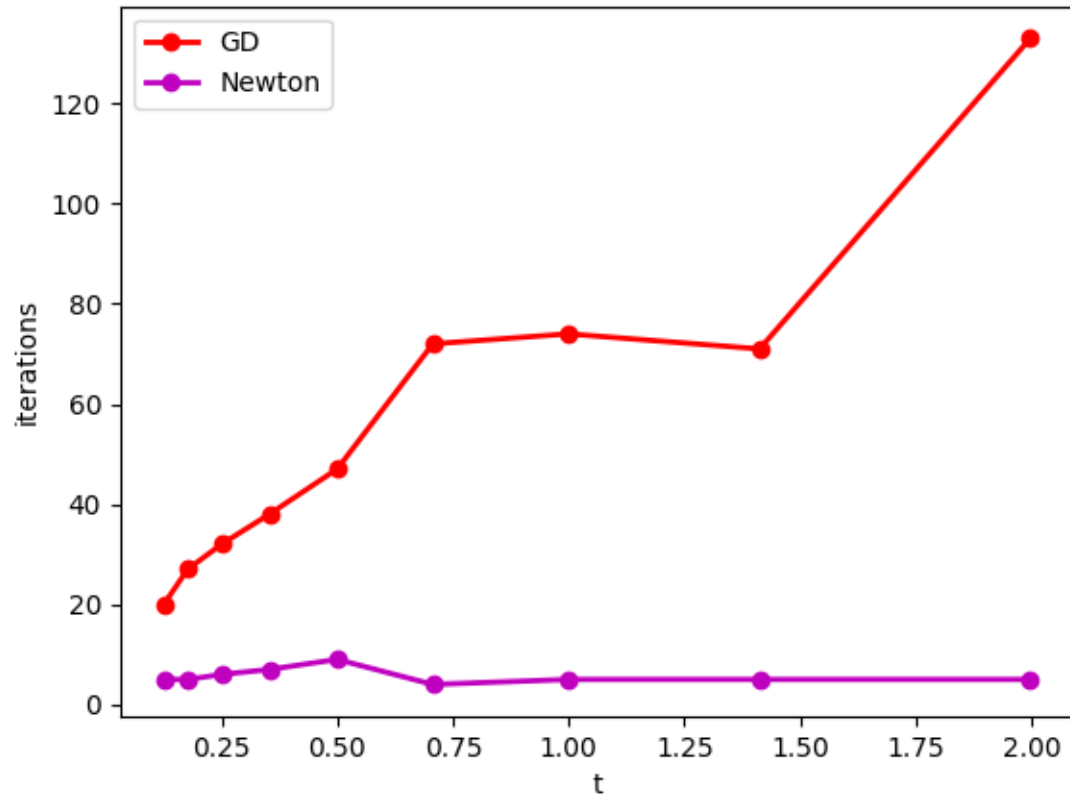
Q1.

1.1 Implementation

   Code updated

1.2 Experiments

1.2.1

We observe that while Newton's method converges really quickly, Gradient Descent takes a lot more iterations to converge to the same point. After a few initial iterations, GD keeps going in a 'zig-zag' fashion while very slowly moving towards the optimal point
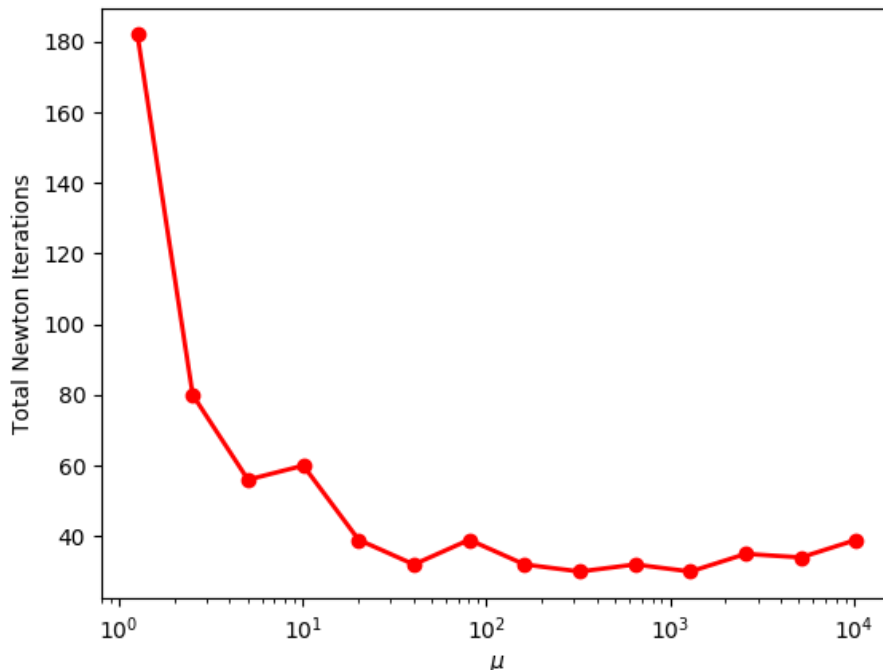
1.2.2

Over here we observe that as the value of t increases, the number of iterations required by the Newton's method is almost independent of t, while for gradient descent the number of iterations are directly proportional to the value of t

2 Log Barrier Method

2.1 Implementation

Code updated

2.2 Experiments

2.2.1   For small μ we expect a small number of Newton steps per outer iteration, but of course a large number of outer iterations since each outer iteration reduces the gap by only a small amount. On the other hand, if μ is large we have the opposite situation. After each outer iteration t increases a large amount, so the current iterate is probably not a very good approximation of the next iterate. Thus, we expect many more inner iterations.

2.2.2   No, it doesn't meet the expectations. As the value of μ increases, we expect the total number of iterations to go high, but they don't seem to.

2.2.3   The minimum value found for the problem is approximately 30610