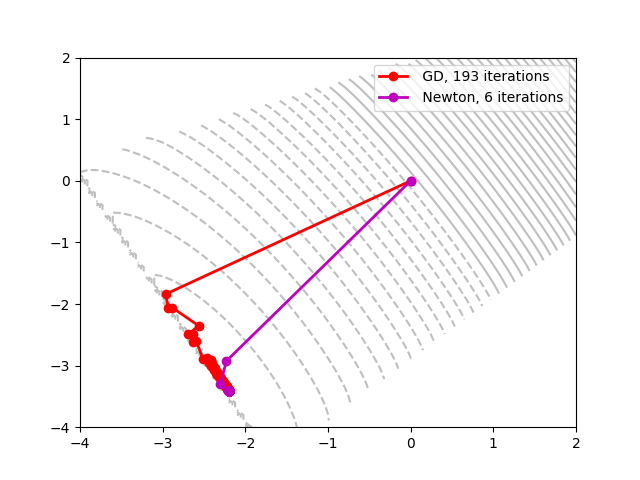
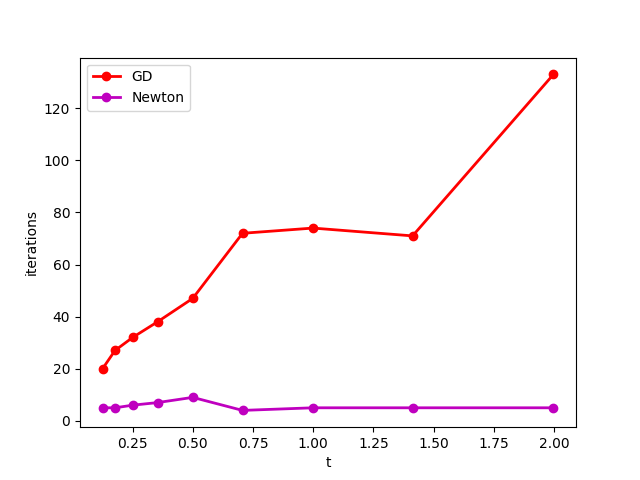
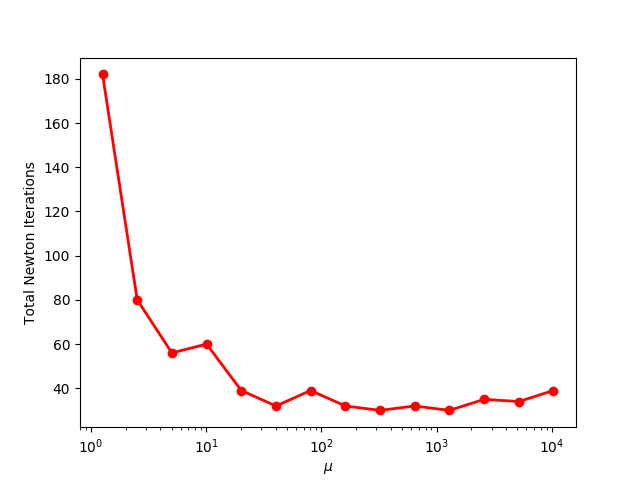
**Convex Optimizations – Homework 3**

**Q1.**

* 1. Implementation   
       
     Code updated
  2. Experiments  
     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
     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

1. **Log Barrier Method**
   1. Implementation  
        
      Code updated
   2. Experiments  
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
        
      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. No, it doesn’t meet the expectations. As the value of increases, we expect the total number of iterations to go high, but they don’t seem to.
      3. The minimum value found for the problem is approximately 30610