



WQD7011  
NUMERICAL OPTIMISATION

LINE SEARCH EXERCISE

Instructor: Dr. Ong Sim Ying

Name : Aswadi Abdul Rahman  
Matrix No : WQD180082

### Question

1. What is the role of second derivative function in Gradient Descent method?
2. Explain `invHess()` in `Newton.py`, in line manner.
3. Calculate the time utilized to run both Gradient Descent method and Newton method when start is set to `[5, 5]`.
4. What are the initial observations from the both results obtained when start is set to `[5, 5]`?
5. If start is set to `[15, 15]`, rerun both methods. What are the observations now?
6. Compare and contrast between Gradient Descent method and Newton method.

### Answer:

1. Second derivatives are used to understand the rate of change of derivatives.
2. `d11`, `d12`, `d21`, `d22` are the value/function for inverse hessian matrix. `hess` function is equal to inverse of hessian matrix
3. 0.0051second for gradient descent, 0.013s for Newton method
4. Gradient descent is faster and having less iteration compare to Newton.
5. Gradient descent stops at 6th iteration due to `z` value to high. Newton still be able to find the local minimum given you increase the iteration to 93(increase from 50).
6. Gradient descent maximizes a function using knowledge of its derivative. Newton's method, a root finding algorithm, maximizes a function using knowledge of its second derivative.