CSC 466/2305 ASSIGNMENT #5 Due: 3 April 2020

This assignment is due at 11:59 PM (i.e., a minute before midnight) on Friday, 3 April 2020.

1. [10 marks]

   Do question 4.2 on page 98 of the Nocedal and Wright textbook.

   The question says,

   > "Experiment with the update rule for the trust region by changing the constants in Algorithm 4.1, or by designing your own rules".

   In the solution that you hand-in, you don't have to discuss your choice of the parameters. Just choose reasonable values for $\hat{\Delta}$, $\Delta_0 \in (0, \hat{\Delta})$ and $\eta \in [0, \frac{1}{4})$. I think it is best if you choose $\eta \in (0, \frac{1}{4})$ (i.e., $\eta > 0$) for the solution that you hand-in, but you can experiment with $\eta = 0$ on your own, if you want.

   Plot the contours of the Rosenbrock function and include on the graph the points x_k produced by your dogleg method.

   Hand in your program and your plot.

2. [10 marks]

   Do question 4.6 on page 99 of your textbook.

3. [10 marks]

   Do question 4.7 on page 99 of the Nocedal and Wright textbook

   In addition to showing that $\|p\|_2$ increases along the double-dogleg path, also show that

   $$m(p) = f + p^T g + \frac{1}{2} p^T B p$$

   decreases along the double-dogleg path.

   [This is similar to Lemma 4.2 on page 75 of the Nocedal and Wright textbook for the dogleg path.]

4. [10 marks]

   Do question 4.8 on page 99 of the Nocedal and Wright textbook.

5. [10 marks]

   Do question 4.12 on page 100 of the Nocedal and Wright textbook.