Assignment 5 of MATP6600/ISYE6780

(Due on Dec-7-2018 in class)

Problem 1

Consider the two-variable minimization problem:

$$\min_{x,y} f(x, y) := 3x^2 + 4y^4.$$

1. Apply one iteration of the steepest descent method with initial point $(1, -2)$ and with stepsize chosen such that the Armijo's condition holds with $\sigma = 0.1$, where we recall the Armijo's condition:

   $$f(\mathbf{x} + \alpha\mathbf{d}) \leq f(\mathbf{x}) + \sigma\alpha\nabla f(\mathbf{x})^\top \mathbf{d}.$$

   To search the stepsize α, start from $\alpha = 1$ and halve it every time if the Armijo's condition does not hold.

2. Apply one iteration of the Newton's method with the same initial point and stepsize search rule as above.

Problem 2

Find the minimum of $6e^{-2\lambda}+2\lambda^2$ on the interval $[-1, 5]$ by Golden section and bisection search methods. [**Requirement:** If you do this problem by hand, write at least five iterations. If you do this problem by programming, set the final length of interval to $\ell = 10^{-2}$ for both methods, and print out your code and all iterations.]

Bonus problem

Construct an unconstrained minimization problem such that the coordinate descent method does not converge or converges to a non-stationary point.