CS / ISyE 730 - Spring 2016 - Homework 4

(assigned 2/16/16, due in class 2/24/16)

1. Consider the following variant of a problem on the midterm exam. For the equality constrained nonlinear optimization problem:

$$\min_x f(x) \text{ s.t. } c_i(x) = 0, \quad i = 1, 2, \ldots, m,$$

suppose that x^* satisfies the KKT conditions, LICQ, and second-order sufficient conditions. Use the implicit function theorem to show that the quadratic penalty function

$$P_\mu(x) := f(x) + \frac{\mu}{2} \sum_{i=1}^{m} c_i^2(x)$$

will have a local minimizer close to x^*, provided that μ is sufficiently large. (Hint: You need to apply the implicit function theorem to the KKT conditions, in conjunction with the reparametrization $\sigma := 1/\mu$ (so that "sufficiently large μ" corresponds to "sufficiently small positive σ.")

2. Do Exercise 18.1 from the textbook.

3. Do Exercise 18.2 from the textbook.

4. Do Exercise 18.3 from the textbook. Note the typo in this question: x^* and x^0 are transposed.

5. Do Exercise 18.5 from the textbook.