**CS726, Fall 2016**

Homework 4 (due Monday 3/12/18 at 6:00pm)

1. Exercise 5 from Chapter 3 of the Draft notes (about short steps).
2. Exercise 9 from Chapter 3 of the Draft notes (about regularized least squares).
3. Exercise 5.2 from **Numerical Optimization, 2nd Ed** .
4. Exercise 5.7 from **Numerical Optimization, 2nd Ed** .
5. For the quadratic function of Section 4.6 in the Draft notes, prove the following bounds:

$$\|x^0 - x^*\|_2^2 \leq n/3, \quad \|x^k - x^*\|^2 \geq \frac{(n-k)^3}{3(n+1)^2} \geq \frac{(n-k)^3}{n(n+1)^2}\|x^0 - x^*\|^2.$$

(The bound (4.40) in the Draft notes follows by setting $k = \frac{n}{2} - 1$ in this expression and noting that it is decreasing in $k$.)