Fall 2016, CSE/CS 383, Homework 2
Due 9:30am, 9/15. Also submit electronic PDF (scans are ok)

Reading: Textbook lectures 3-7.

1. [**20 points.** *Vector norms*] Textbook 3.3, 3.4

2. [**20 points.** *Projections*] Textbook 6.2, and 6.3 and 6.5.
   Note: for 6.3, do not use the SVD.

3. [**30 points.** *Oblique projection*] Prove the oblique projection formula we discussed in `lec05.pdf`. Let $P \in \mathbb{R}^{m\times m}$ be an oblique projetion operator to an n-dimensional subspace. Assume A is given, has full rank, and $\text{Range}(P) = \text{Range}(A)$. Assume B is given, has full rank, and $\text{Range}(B) \perp \text{Null}(P)$. Show that $P = A(B^TA)^{-1}B^T$.

4. [**30 points.** *More on SVD*] Let $A \in \mathbb{R}^{m\times n}$, $m \geq n$, full rank and let Q and R be its QR factors. (a) Determine the reduced SVD of A from the reduced SVD of R. (b) Determine the singular values of $[I; A]$, where I is the n-by-n identity matrix.