Homework # 3

The first two problems are due next Wednesday (2/04) and the computer assignment is due in two weeks on 2/11.

1. Show that

$$A^{T}(AA^{T} + \lambda I_{n})^{-1} = (A^{T}A + \lambda I_{m})^{-1}A^{T}.$$

- 2. let $x \in \mathbb{R}^m$. Show that the norms $||x||_p, p \ge 1$ are convex functions of x. Show that the 1-norm is convex but not strictly convex.
- 3. Consider the problem b = Ax + n, where x and n are independent Gaussian random vectors. x is $N(0, R_x)$ and n is $N(0, R_n)$. Assume R_x and R_n are positive definite matrices. Find the MAP estimate of x.
- 4. Matlab Computer Study
 - (a) Conduct computer experiments to compare the performance of l₁ norm based sparse signal recovery with Matching Pursuit type algorithms from the last homework.
 - (b) Please include a complexity (flop count) study.