Computational Linear Algebra, Assignment 2, Part I

Maya Shende

Due: March 7th, 2018

1.

2. We can conclude that the nullspace(A) = nullspace(A^TA) by proposition 8.5. We can further conclude that the dim(nullspace(A)) = dim(nullspace(A^TA)) by Theorem 8.3. ■

3. Suppose A is an $m \times n$ matrix with rank r. By Theorem 8.3, we know dim(nullspace(A)) = n-r. We also know that A^TA is an $n \times n$ matrix. By proposition 8.5, nullspace(A) = nullspace(A^TA)), and by Theorem 8.3, dim(nullspace(A))=dim(nullspace(A^TA))=n-r. Now, since both A and A^TA have n columns, we can conclude that A^TA also has rank r. Thus, rank(A) = rank(A^TA). ■