

SECTION 1.3
EXERCISE #39

2.3.39 Prove that for matrix A , the matrix AA^T is symmetric.

Proof

Recall that a matrix B is symmetric if $B = B^T$ (see Definition 1.11). Recall that $(B^T)^T = B$ and $(AB)^T = B^T A^T$ (see Note 1.3.B).

We show that AA^T is symmetric by showing that $(AA^T)^T = AA^T$. Consider $(AA^T)^T = (A^T)^T A^T$ since $(AB)^T = B^T A^T$
 $= AA^T$ since $(A^T)^T = A$.

So, AA^T is symmetric. \square