

# Symmetric Matrices

A matrix is symmetric when  $A = A^T$

## Proof

We shall transpose  $A^T A$

$$(A^T A)^T = A^T (A^T)^T = A^T A$$

It ends up being equal to itself ( $A^T A$ )

## Properties

$$(A A^T)^T = (A^T)^T A^T = A A^T \Rightarrow \text{symmetric}$$

$$(\vec{x} \vec{x}^T)^T = (\vec{x}^T)^T \vec{x}^T = \vec{x} \vec{x}^T \Rightarrow \text{symmetric}$$

$$(C^2)^T = (C C)^T = C^T C^T = C C = C^2 \Rightarrow \text{symmetric}$$