

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

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

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

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