# Quadratic Forms

If $Q(x)$ is a function, then,

$$Q(\vec{x}) = \vec{x}^T A \vec{x}$$

$A$ is symmetric

# Examples

## Find $Q$

$Q(\vec{x}) = \vec{x}^T A \vec{x}$, $A = \begin{bmatrix} 4 & 1 \\ 1 & -3 \end{bmatrix}$

$$\begin{bmatrix} x & y \end{bmatrix} \begin{bmatrix} 4 & 1 \\ 1 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = 4x^2 + 2xy - 3y^2$$