



**Definition**

Let  $A \in \mathbf{S}^n$  (i.e.,  $A \in \mathbf{R}^{n \times n}$  and symmetric).  $A$  is *positive definite* if

$$x^\top Ax > 0 \quad \text{for all nonzero } x \in \mathbf{R}^d$$

$A$  is *positive semidefinite* (or *nonnegative definite*) if

$$x^\top Ax \geq 0 \quad \text{for all } x \in \mathbf{R}^d$$

**Notation**

We denote the set of positive definite  $d$  by  $d$  matrices by  $\mathbf{S}_{++}^d$ . We denote the set of positive semidefinite  $d$  by  $d$  matrices by  $\mathbf{S}_+^d$ .



