



## Why

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## Definition

Let  $A \in \mathbf{R}^{n \times n}$  be symmetric.  $A$  is *positive definite* if, for all  $x \in \mathbf{R}^d$ ,  $x \neq 0$ ,  $x^\top A x > 0$ .  $A$  is *positive semidefinite* (or *nonnegative definite*) if, for all  $x \in \mathbf{R}^d$ ,  $x^\top A x \geq 0$ .

## Notation

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

## Characterizations

**Proposition 1.** *Let  $A \in \mathbf{S}^d$  and denote the smallest*

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<sup>1</sup>Future editions will elaborate.



