



## MATRIX SQUARES

### Definition

The *square* of a square matrix is the product of the matrix with itself. A *square root* (or *matrix square root*) of a given matrix is a matrix whose square is the given matrix. A matrix is *idempotent* if it is equal to its square.

### Notation

Let  $A \in \mathbf{R}^{n \times n}$ . Then the square of  $A$  is  $AA$ . We denote the square of  $A$  by  $A^2$ .  $A$  is idempotent if  $A^2 = A$ .  $B \in \mathbf{R}^{n \times n}$  is a square root of  $A$  if  $A = B^2$ .

### Existence and uniqueness

Clearly a matrix can have a square root. Take for example the matrix in  $\mathbf{R}^{1 \times 1}$   $\begin{bmatrix} 1 \end{bmatrix}$ . A square root of this matrix is  $\begin{pmatrix} 1 \end{pmatrix}$ , but also  $\begin{pmatrix} -1 \end{pmatrix}$ . So matrix square roots do exist, but are not unique.



