



## Why

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## Definition

Let  $A \in \mathbf{R}^{l \times m}$  and  $B \in \mathbf{R}^{m \times n}$ . In this case we call  $A$  and  $B$  *conformable*. The *matrix-matrix product* of  $A$  and  $B$  is the matrix  $C \in \mathbf{R}^{l \times n}$  whose  $i$ th row  $c_i$  (for  $i = 1, \dots, n$ ) is defined  $c_i = Ab_i$  where  $b_i$  is the  $i$ th row of  $B$ .

## Notation

We denote the matrix product of  $A$  and  $B$  by  $AB$ .

## Properties

Future editions will contain accounts of the following basic properties.

**Proposition 1.** *Matrix multiplication is associative.*

**Proposition 2.** *Matrix multiplication is not commutative.*

Indeed, the matrix-matrix product of  $B$  and  $A$  may not even be defined, if  $B$  and  $A$  are not conformable.

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



