

**conj()** — Complex conjugate

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## Description

`conj(Z)` returns the elementwise complex conjugate of  $Z$ , that is,  $\text{conj}(a+bi) = a - bi$ . `conj()` may be used with real or complex matrices. If  $Z$  is real,  $Z$  is returned unmodified.

`_conj(A)` replaces  $A$  with  $\text{conj}(A)$ . Coding `_conj(A)` is equivalent to coding  $A = \text{conj}(A)$ , except that less memory is used.

## Syntax

*numeric matrix*    `conj(numeric matrix Z)`

*void*                `_conj(numeric matrix A)`

## Remarks and examples

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Given  $m \times n$  matrix  $Z$ , `conj(Z)` returns an  $m \times n$  matrix; it does not return the transpose. To obtain the conjugate transpose matrix, also known as the adjoint matrix, adjugate matrix, Hermitian adjoint, or Hermitian transpose, code

$$Z'$$

See [M-2] [op\\_transpose](#).

A matrix equal to its conjugate transpose is called Hermitian or self-adjoint, although in this manual, we often use the term symmetric.

## Conformability

`conj(Z)`:

*Z*:             $r \times c$   
*result*:       $r \times c$

`_conj(A)`:

*input*:  
*A*:             $r \times c$   
*output*:  
*A*:             $r \times c$

## Diagnostics

`conj(Z)` returns a real matrix if  $Z$  is real and a complex matrix if  $Z$  is complex.

`conj(Z)`, if  $Z$  is real, returns  $Z$  itself and not a copy. This makes `conj()` execute instantly when applied to real matrices.

`_conj(A)` does nothing if  $A$  is real (and hence, does not abort if  $A$  is a view).

## Also see

[M-5] `_transpose()` — Transposition in place

[M-4] **Scalar** — Scalar mathematical functions

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