

linalg — Convenience macros for typesetting linear algebra *

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Abstract

This package sets up various packages and defines a series of macros to aid the writing of mathematical texts that contain algebraic notation.

1 Package Loading and Setup

This package has no options.

Once `linalg` has been loaded in the usual way with `\usepackage`, it will automatically load the packages `amsmath` and `amssymb` (via `mathtools`), `array` as well as `unicode-math` (which, in turn, loads `fontspec`).

1.1 Font Settings

The default fonts for regular text and for maths may be set using the interfaces provided by `fontspec` and `unicode-math` respectively. For example, the following lines in the preamble

```
\setmainfont{TeX Gyre Termes}  
\setmathfont[Scale=MatchLowercase]{STIX Math}
```

will load the TeX Gyre Termes font family for use in text mode and the STIX Math font for maths. For further details, refer to the documentation of the above-mentioned packages.

1.2 Maths style

By default, Latin and Greek letters are typeset in italics when regular weight is used and in upright shape when the bold variants are used, as shown in the table below

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Weight	Example
Regular	$a, b, A, B, \gamma, \delta, \Gamma, \Delta$
Bold	$\mathbf{a}, \mathbf{b}, \mathbf{A}, \mathbf{B}, \boldsymbol{\gamma}, \boldsymbol{\delta}, \boldsymbol{\Gamma}, \boldsymbol{\Delta}$

The default typographic style may be changed using `\unimathsetup`. For example:

```
\unimathsetup{math-style=ISO,bold-style=ISO}
```

selects italics for both regular and bold variants. See `unicode-math`'s documentation for details on the different styles available.

2 Macros

2.1 Symbols Representing Vectors and Matrices

`\vct` The macros `\vct` and `\mtr` are provided to denote vectors and matrices in
`\mtr` math mode. The arguments to these commands are typeset in boldface. (To change this behaviour the user may redefine the macros.)

In addition, the following shorthands are defined for Latin and Greek lowercase letters:

a	<code>\av</code>	b	<code>\bv</code>	c	<code>\cv</code>	d	<code>\dv</code>
e	<code>\ev</code>	f	<code>\fv</code>	g	<code>\gv</code>	h	<code>\hvec</code>
i	<code>\iv</code>	j	<code>\jv</code>	k	<code>\kv</code>	l	<code>\lv</code>
m	<code>\mv</code>	n	<code>\nv</code>	o	<code>\ov</code>	p	<code>\pv</code>
q	<code>\qv</code>	r	<code>\rv</code>	s	<code>\sv</code>	t	<code>\tv</code>
u	<code>\uv</code>	v	<code>\vv</code>	w	<code>\wv</code>	x	<code>\xv</code>
y	<code>\yv</code>	z	<code>\zv</code>				
α	<code>\alphav</code>	β	<code>\betav</code>	γ	<code>\gammav</code>	δ	<code>\deltav</code>
ε	<code>\epsilonv</code>	ε	<code>\varepsilonv</code>	ζ	<code>\zetav</code>	η	<code>\etav</code>
θ	<code>\thetav</code>	θ	<code>\varthetav</code>	κ	<code>\kappav</code>	λ	<code>\lambdav</code>

as well as for uppercase letters:

A	<code>\Am</code>	B	<code>\Bm</code>	C	<code>\Cm</code>	D	<code>\Dm</code>
E	<code>\Em</code>	F	<code>\Fm</code>	G	<code>\Gm</code>	H	<code>\Hm</code>
I	<code>\Imat</code>	J	<code>\Jm</code>	K	<code>\Km</code>	L	<code>\Lm</code>
M	<code>\Mm</code>	N	<code>\Nm</code>	O	<code>\Om</code>	P	<code>\Pm</code>
Q	<code>\Qm</code>	R	<code>\Rm</code>	S	<code>\Sm</code>	T	<code>\Tm</code>
U	<code>\Um</code>	V	<code>\Vm</code>	W	<code>\Wm</code>	X	<code>\Xm</code>
Y	<code>\Ym</code>	Z	<code>\Zm</code>				
Γ	<code>\Gammam</code>	Δ	<code>\Deltam</code>	Θ	<code>\Thetam</code>	Λ	<code>\Lambdam</code>
Ξ	<code>\Xim</code>	Π	<code>\Pim</code>	Σ	<code>\Sigmam</code>	Υ	<code>\Upsilonm</code>
Φ	<code>\Phim</code>	Ψ	<code>\Psim</code>	Ω	<code>\Omegam</code>		

Internally these commands use `\vct` and `\mtr`, so that it is easy to change the notation for vectors and matrices.

`\tr` Finally, the macros `\tr` and `\inv` are intended to be used in super-
`\inv` scripts, to denote the transpose and the inverse of a matrix.

2.2 Matrices

The matrix environments provided by `amsmath` (namely `matrix`, `pmatrix`, `bmatrix`, `bmatrix`, `vmatrix` and `Vmatrix`) are modified to accept an optional argument specifying a column formatting like that of `tabular`. This can be used to change the alignment of columns and to add vertical rules, for example:

```
\[
\begin{bmatrix}cc|c]
a & b & c \\\ d & e & f
\end{bmatrix}
```

$$\begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix}$$

By default, columns are right-aligned.

`\arr` In addition to that, the following shorthand macros are defined:
`\arr*`

`\arr[⟨cols⟩]{⟨body⟩}`
 Puts *⟨body⟩* inside a `bmatrix` environment.

`\arr*[⟨cols⟩]{⟨body⟩}`
 Puts *⟨body⟩* inside a `matrix` environment.

2.3 Paired Delimiters and Operators

`\set` The following paired delimiters are defined:
`\abs` `{...}` `\set` `|...|` `\abs` `||...||` `\norm`
`\norm`
`\set*` The delimiters above are automatically extensible so that they match the
`\abs*` height of the enclosed material. The starred alternatives `\set*`, `\abs*` and
`\norm*` `\norm*` produce delimiters that are fixed in size.

The following math operators are defined:

```
col \colsp nul \nullsp rank \rank tr \trace
diag \diag sgn \sign
```

2.4 Additional Symbols

The following additional symbols are defined

```
\R \R \C \Cset \N \N \Z \Z
```