The **HEP-MATH** package*

Extended math macros

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**Abstract**

The **HEP-MATH** package provides some additional features beyond the **MATH-TOOLS** and **AMSMATH** packages.

To use the package place `\usepackage{hep-math}` in the preamble.

The **MATHTOOLS** [1] package is loaded, which in turn loads the **AMS-TEX** **AMSMATH** [2] package. Horizontal spacing in inline equations and page breaks in block equations are marginally adjusted. Spacing around `\left` and `\right` is fixed with the **MLEFTRIGHT** package [3].

1 Macros

`\mathdef` The `\mathdef{⟨name⟩}{(arguments)}{⟨code⟩}` macro (re-)defines macros only within math mode without changing the text mode definition.

`\i` The imaginary unit `\i` and the differential `\d` are defined using this functionality.

`\overline` The `\overline` macro is adjusted to work also outside of math mode using the **SOUUUFS** [4] package.

`\set` A better looking over left right arrow is defined *i.e.* `\set{⟨over⟩}{⟨math⟩}` functionality.

`\overleft` Diagonal matrix `\diag`, signum `\sgn`, trace `\tr`, `\Tr`, and `\rank` operators are defined.

`\overleftright` The real and imaginary projectors are redefined to look like ordinary operators.

`\cos` and `\tan` are adjusted to have the same height as `\sin`.

`\arccsc` and other inverse trigonometric functions are defined.

1.1 Fractions and units

The correct spacing for units is provided by the macro `\unit{⟨value⟩}{⟨unit⟩}` from the **UNITS** package [5] which can also be used in text mode. The macro

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\texttt{\textbackslash{}inv\{power\}\{text\}} allows to avoid math mode also for inverse units such as 5 fb$^{-1}$ typeset via \texttt{\textbackslash{}unit\{\textbackslash{}inv\{fb\}\}}.

\texttt{\nicefrac}

The \texttt{\textbackslash{}fract\{number\}\{number\}} macro is accompanied by \texttt{\nicefrac\{number\}\{number\}}, \texttt{\textbackslash{}textfract\{number\}\{number\}}, and \texttt{\textbackslash{}flatfract\{number\}\{number\}} leading to $\frac{1}{2}$, $\frac{1}{2}$, and $\frac{1}{2}$. The \texttt{\textbackslash{}textfract} macro is mostly intended if a font with oldstyle numerals is used.

Some macros of the physics package [6] are reimplemented with a more conventional typesetting in mind. Finer details about mathematical typesetting can be found in [7].

1.2 Differentials and derivatives

The three macros \texttt{\textbackslash{}differential\{symbol\}}, \texttt{\textbackslash{}newderivative\{name\}\{symbol\}}, and \texttt{\textbackslash{}newpartialderivative\{name\}\{symbol\}} allow to define a differential with correct spacing, a derivative using this differential, and if necessary a partial derivative that can handle three dimensional derivatives.

These macros are used for the usual differential and derivative, producing $dx$ via \texttt{\textbackslash{}d x} and

\[
\begin{align*}
\text{\texttt{\dv}[f]x} & \quad \text{\texttt{\dv}[f]x^n} & \quad \text{\texttt{\dv}[f]x^n} \\
\frac{df}{dx} & \quad \frac{d^n f}{dx^n} & \quad \frac{d^n f}{dx^n} \\
\text{\texttt{\d x}} & \quad \text{\texttt{\dx[f]x}} & \quad \text{\texttt{\dx[x]f}} & \quad \text{\texttt{\dx[x]f}} \\
\frac{d}{dx} f & \quad \frac{d}{dx} f & \quad \frac{d}{dx} f & \quad \frac{d}{dx} f
\end{align*}
\]

via \texttt{\texttt{\textbackslash{}d x}\{f\}\{x\}\{n\}}. Upright differential can be produced via \texttt{\renewcommand\{\textbackslash{}diffsymbol\}\{\textbackslash{}mathrm\ \textbackslash{}d\}}.

Similarly a partial differential and derivative are defined that can be used according to \texttt{\textbackslash{}pdv\{f\}\{x\}\{a\}\{y\}\{b\}\{z\}\{c\}}.

\[
\begin{align*}
\text{\texttt{\pdv}[f]x} & \quad \text{\texttt{\pdv}[f]x[y]} & \quad \text{\texttt{\pdv}[f]x^3} & \quad \text{\texttt{\pdv}[f]x^2[y]} \\
\frac{\partial f}{\partial x} & \quad \frac{\partial^3 f}{\partial x^3} & \quad \frac{\partial^3 f}{\partial x^3} & \quad \frac{\partial^3 f}{\partial x^3} \\
\text{\texttt{\pdv}[f]x^2[y]^3} & \quad \text{\texttt{\pdv}[f]x[y]^3} & \quad \text{\texttt{\pdv} x[y]f} \\
\frac{\partial^5 f}{\partial x^2 \partial y^3} & \quad \frac{\partial^3 f}{\partial x^3} & \quad \frac{\partial^2 f}{\partial x^2 \partial y^3}
\end{align*}
\]

\texttt{\cancel\{characters\}} macro from the cancel package [8] and the \texttt{\slashed\{character\}} macro from the slashed package [9] allow to cancel math and use the Dirac slash notation i.e. $\not{\partial}$, respectively.

1.3 Paired delimiters

\texttt{\abs}

\texttt{\norm}
\begin{equation}
\left. \begin{array}{c}
\text{left} \\
= \text{right}
\end{array} \right\} .
\end{equation}

\begin{equation}
\left. \begin{array}{c}
\text{left} \\
= \text{right} \ 1 \ + \right. \\
\end{array} \right\} .
\end{equation}

\begin{equation}
\left. \begin{array}{c}
\text{left} \\
= \text{right} \ 1 \ \ + \right. \\
\end{array} \right\} .
\end{equation}
\begin{equation} \begin{split} left &= right 1 \\ &\quad \&= right 2 \ . \\ \end{split} \end{equation}

\begin{align} left &= right \ , & left &= right \ , \ (4a) \\
left &= right \ , & left &= right \ . \ (4b) \\
\end{align}

\begin{subequations} \begin{alignat}{2} left &= long right \quad \&\quad , & le. 2 &= ri. 2 \ , & le. 3 &= ri. 3 \ . \ (6a) \\
le. 3 &= ri. 3 \quad \&\quad . & \end{alignat} \end{subequations}

As a rule of thumb if you have to use \texttt{\notag}, \texttt{\nonumber}, or perform manual spacing via \texttt{\quad} you are probably using the wrong environment.

References


[2] \textit{\LaTeX} Team. ‘The \texttt{amsmath} package: AMS mathematical facilities for \LaTeX’ (1994). CTAN: \texttt{amsmath}. \url{ams.org/tex/amslatex}.
