

# The `empheq07` package<sup>\*</sup> Emphasizing equations in L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub><sup>†</sup>

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## Abstract

The `empheq07` package automatically detects several `amsmath` environments and the size of the displayed math material. The user interface makes it easy to add various kinds of visual markup to these equations.

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## 1 Important Notice

This package (`empheq07 v0.7e`) is no longer supported. See the documentation of `empheq` for more details.

## 2 Introduction

Users who have wanted to put a system of equations inside boxes has hitherto been forced to use the features of `fancybox` or the `\boxed` command of `amsmath`. Both alternatives have serious limitations though. `fancybox` allows only `eqnarray`-style equations and at the end of the day they aren't all that pretty. Most mathematical typesetting in L<sup>A</sup>T<sub>E</sub>X is done with the aid of `amsmath` anyway, but it only offers the

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<sup>†</sup>Thanks to Lars Madsen for asking for the subtle feature that evolved into this package.

single line quick-fix `\boxed`. What we really want is something that will enable us to do something along the likes of this:

$$\tilde{S} = 1 \Rightarrow \begin{cases} a = \int_{-2}^3 tb^t dt & \text{and} \\ c = d - a \end{cases} \quad \begin{matrix} (1a) \\ (1b) \end{matrix}$$

As you can see, `empheq07` can do all the tricks the `cases` package by Donald Arseneau can do and more. It even supports `subequations`—as shown in equations (1a) and (1b)—from `amsmath` without complaining.

In order to combine the best of two worlds the `empheq07` package tries to take advantage of the widespread features of `amsmath`. As it should be well known if you read this, `amsmath` has amongst its arsenal of structures `align`, `gather`, `alignat` and `multline`. `empheq07` works with these as well as their starred variants.

“But what about `equation`?” you say. `equation` is (in my opinion) merely a poor man’s `gather`. If you really want to use `empheq07`’s features on a one-liner (no pun intended) go with `gather`. Anyway the real goal of this package is to do nifty tricks with multi line equations ...

### 3 Examples

Any options given to `empheq07` is passed on to `amsmath`, thus the line

```
\usepackage[options]{empheq07}
```

will load `amsmath` with exactly those options. `empheq07` doesn’t redefine anything so to use it in an existing document you need only replace `amsmath` with `empheq07`—no harm done.

`empheq07` is *really* easy to use; you simply put an `empheq` environment around your `amsmath` environment:

```
\begin{empheq}
  \begin{align}
    E&=mc^2 \\
    Y&= \sum_{n=1}^{\infty} \frac{1}{n^2}
  \end{align}
\end{empheq}
```

$$E = mc^2 \quad (2)$$

$$Y = \sum_{n=1}^{\infty} \frac{1}{n^2} \quad (3)$$

Impressed? No? Well then I guess it’s about time I told you about the *optional* argument of the `empheq` environment. It allows you control what material to put on either side of the math and the sort of box to go around it all. That means that we can say

```

\begin{empheq}[boxtype=\fbox]
\begin{align}
E&=mc^2 \\
Y&= \sum_{n=1}^{\infty} \frac{1}{n^2}
\end{align}
\end{empheq}

```

to obtain the display

$$E = mc^2 \tag{4}$$

$$Y = \sum_{n=1}^{\infty} \frac{1}{n^2} \tag{5}$$

This requires the use of the `keyval` package from the tools bundle, which is undoubtedly installed on your system. When using the `keyval` package there are a few things we need to keep in mind. In mathematical typesetting ‘=’ and ‘,’ are quite frequently used, thus requiring the user to enclose them in braces:

```

\begin{empheq}[boxtype=\fbox,
Left={\langle a,b \rangle = \langle c,i \rangle} \Rightarrow\empheqlbrace]]
\begin{alignat}{2}
\langle a,b \rangle &= (\cos^a c, \tan^b i) \quad \text{for } i > 1 \\
\langle a,b \rangle &= (\arccos x^a, \arctan i^b) \quad \text{for } i \leq 1
\end{alignat}
\end{empheq}

```

$$\langle a,b \rangle = \langle c,i \rangle \Rightarrow \begin{cases} (a,b) = (\cos^a c, \tan^b i) & \text{for } i > 1 \\ (a,b) = (\arccos x^a, \arctan i^b) & \text{for } i \leq 1 \end{cases} \tag{6}$$

$$\tag{7}$$

The same with cases from `amsmath` for comparison:

$$\langle a,b \rangle = \langle c,i \rangle \Rightarrow \begin{cases} (a,b) = (\cos^a c, \tan^b i) & \text{for } i > 1 \\ (a,b) = (\arccos x^a, \arctan i^b) & \text{for } i \leq 1 \end{cases}$$

Notice that `cases` uses an array for the conditions, so you have to force `\displaystyle` yourself. This is not needed with `empheq07` as you’re already using a `\displaystyle` environment such as `gather` etc.

Observe what can be done if we replace `\fbox` with another framed box and add some space on all sides:

```

\definecolor{lightblue}{rgb}{.8, .8, 1}
\begin{empheq}[boxtype={\setlength{\fboxsep}{10pt}%
\colorbox{lightblue}},
Right={\empheqrbrace \beta}]
.
.

```

`\end{empheq}`

$$\left. \begin{aligned} a &= \int_{-2}^3 tb^t dt \quad \text{and} \\ c &= d - a \end{aligned} \right\} \beta \quad (8)$$

As a convenience for the user, it is also possible to declare delimiters with the commands `\DeclareRightDelimiter{<delim>}` and its companion `\DeclareLeftDelimiter{<delim>}`. For instance the commands

`\DeclareRightDelimiter{\rangle}` defines `\empheqrangle`

and

`\DeclareLeftDelimiter{\langle}` defines `\empheqlangle`.

The usage is simple.

```
\begin{empheq}[Right=\empheqrangle,
               Left=\empheqlangle]
\begin{gather}
a=b \\\
c=d
\end{gather}
\end{empheq}
```

$$\left\langle \begin{aligned} a &= b \\ c &= d \end{aligned} \right\rangle \quad (10)$$

`\DeclareRightDelimiter` and its companion have an optional argument which controls spacing (default is a negative thinspace), but beware: It will simply overwrite the original definition and it might not look all that pretty as the following example shows:

```
\DeclareRightDelimiter[\>]{\rangle}
\DeclareLeftDelimiter[\mkern-10mu]{\langle}
```

$$\left\langle \begin{aligned} a &= b \\ c &= d \end{aligned} \right\rangle \quad (12)$$

These examples will have given you a glimpse of the possibilities `empheq07` offers. In particular the commands `\empheqlbrace` and `\empheqrbrace` produce braces just tall enough to encompass the display. You can of course use `\big...` delimiters if you want.

## 4 Bugs and shortcomings

This package (`empheq07`) is not supported anymore. Try with the new version and see if it works; if not, then contact me. See how in the manual of `empheq`.