

L^AT_EX Math Tricks

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Prerequisites

- `\documentclass`
- `\usepackage`
- Environments
- Math mode

Math Mode

- Uses *math italic* font
- Uses different spacing, ignoring all but explicit spaces
- More flexibility in moving off of baseline
- Sometimes *displayed*

Why L^AT_EX?

- Defacto standard for mathematical typesetting
- Many journals accept papers in that format, and even supply style files
- Superior quality
- Multiple platforms
- Programmable

Texmaker

- <http://www.xmlmath.net/texmaker/>
- Free
- Knows symbols and environments
- PDF synchronization
- Text folding

Points of Style

- Mathematical notation is a subset of English.
- Punctuation
- Math italic vs. roman fonts

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In the sequel we shall use

$$f(x) = \begin{cases} 0 & x < 0, \\ \sin x & \text{otherwise.} \end{cases}$$

AMS Math

- `\usepackage{amsmath, amsfonts, amssymb}`
- Provides blackboard bold fonts (\mathbb{R}^n)
- Provides `\align` and `\cases`

Alignment

... and a corresponding sequence of closed form mesoscopic continuum equations (written here for an isolated system with zero exterior forces)

$$(3.1) \quad \partial_t \bar{\rho}^\eta + \partial_x (\bar{\rho}^\eta \bar{v}^\eta) = 0$$

$$(3.2) \quad \partial_t (\bar{\rho}^\eta \bar{v}^\eta) + \partial_x (\bar{\rho}^\eta (\bar{v}^\eta)^2) - \partial_x (T_{(c),n}^\eta + T_{(int),n}^\eta) = 0$$

Alignment

`\ldots` and a corresponding sequence of closed form mesoscopic continuum equations (written here for an isolated system with zero exterior forces)

```

\begin{align}
\partial_t \bar{\rho}^\eta +
\partial_x(\bar{\rho}^\eta \bar{v}^\eta) &= 0 \\
\partial_t(\bar{\rho}^\eta \bar{v}^\eta) +
\partial_x(\bar{\rho}^\eta (\bar{v}^\eta)^2) -
\partial_x(T_{(\text{c}),n}^\eta +
T_{(\text{int}),n}^\eta) &= 0
\end{align}

```

align

- To get only one equation number, use `\notag` on lines not to be numbered.
- To get no equation numbers, use the `align*` environment.
- To get an equation number using the `align*` environment, use e.g. `\tag{2.1}` to put the number in explicitly.
- **Align starts math mode.** You cannot use it when you are already in math mode.

Align

Align can do more than one column, but it can be problematic. In general, use `tabular` or `array` environments for complex layouts.

$$\begin{array}{ll} u = \arctan x, & dv = 1 dx \\ du = \frac{1}{1+x^2} dx, & v = x. \end{array}$$

```
\begin{align*}
u &= \arctan x, & dv &= 1 \, dx \\
du &= \frac{1}{1+x^2} dx, & v &= x.
\end{align*}
```

Matrices

Consider the matrix

$$A = \begin{pmatrix} 3 & -4 \\ \alpha & \frac{\alpha}{2} \end{pmatrix}.$$

Matrices

Consider the matrix

```
\begin{equation*}
```

```
A =
```

```
\begin{pmatrix}
```

```
3 & -4 \\
```

```
\alpha & \frac{\alpha}{2}
```

```
\end{pmatrix}
```

```
\end{equation*}
```

Matrices

- Several different environments
- `pmatrix` - parenthesis matrix
- `bmatrix` - bracket matrix
- `array` - just make an array and specify delimiters using `\left` and `\right`. This requires an argument to describe alignment of each column.

Matrices

Consider the array

$$A = \left\{ \begin{array}{cc} 3 & -4 \\ \alpha & \frac{\alpha}{2} \end{array} \right\}.$$

Piecewise-defined functions

In the sequel we shall use

$$f(x) = \begin{cases} 0 & x < 0, \\ \sin x & \text{otherwise.} \end{cases}$$

`\cases`

In the sequel we shall use

`$$`

`f(x) =`

`\begin{cases}`

`0 & x < 0, \\`

`\sin x & \text{otherwise}.`

`\end{cases}`

`$$`

Display Math

- Display formulas that would force text to be badly spaced vertically
- Display long lines
- If the displayed line is still too long, break the line before an equal sign or addition symbol. Shift the continuation line by a `\qquad`.

Mathematical Spacing

- L^AT_EX usually spaces mathematics properly
- Sometimes you need to put in explicit space for clarity.
- Use a thin space (`\,`) for integrals: $\int_0^\infty \sin x dx$ vs. $\int_0^\infty \sin x dx$
- Use an ordinary space (`\`) for qualifications:
 $f_N(x) = \sum_{i=0}^N x^i$ for $N = 1, 2, \dots$
- Use a `\quad` for continuations:

$$\sum_{n=1}^{\infty} \frac{1}{n} > 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{4}$$

`\quad` here \rightarrow

 $+ \frac{1}{8} + \cdots + \frac{1}{8} + \cdots$

$\overbrace{\hspace{10em}}^{4 \text{ times}}$

Details

- Use `\left` and `\right` liberally
- Use `\sum` when you want a sum - not `\Sigma`
- Match ellipses to the surrounding notation: $, \dots,$ vs. $+ \cdots +$.
- Plain T_E^X commands still work in $\text{L}^A\text{T}_\text{E}^X$.