1 Math enviornments

Inline elements

1. using `$...$`: $a + b = c$
2. using `\[...\]`: $a/b = c$
3. using environment `\begin{math}...\end{math}`): $a - b = c$

Takeaway: Although there are said to be issues, or incompatibilities with using `$...$`, most examples and working code use this shorthand for inline math. If for whatever reason you do find issues, then use `\(...\)`.

Blocked elements

1. using `$$...$$`:
$$\frac{a}{b} = c$$
2. using `\[...\]`:
$$\int_b^a = c$$
3. using enviornment `\begin{displaymath}...\end{displaymath}`:
$$\frac{\partial a}{\partial b} = c$$

Takeaway: Much like for inline math, `$$...$$` is commonly used. However, if you do find issues (which rarely does), then use `\[...\]`.

Alignments & numberings

1. Numbered equations
$$\mathrm{KE} = 1/2mv^2 \tag{1}$$
2. No numbered equations (trick, similar to section numberings)
$$\mathrm{PE} = \int_{\mathrm{ref}}^{x} F \, \mathrm{d}\overrightarrow{x}$$

3. Numbered equations (not aligned)

$$\exp^{ix} = \cos x + i\sin(x) \tag{2}$$

$$\exp^{i\pi} + 1 = 0 \tag{3}$$

4. Numbered and aligned

$$\nabla \cdot \vec{D} = \rho_v \tag{4}$$

$$\nabla \cdot \vec{B} = 0 \tag{5}$$

$$\nabla \times \vec{E} = -\frac{\partial B}{\partial t} \tag{6}$$

$$\nabla \times \vec{B} = \mu_0 \vec{J} + \mu_0 \epsilon_0 \frac{\partial E}{\partial t} \tag{7}$$

5. Controlling numbering and alignment

$$\nabla \cdot \vec{D} = \rho_v$$

$$\nabla \cdot \vec{B} = 0 \tag{8}$$

$$\nabla \times \vec{E} = -\frac{\partial B}{\partial t} \tag{9}$$

$$\nabla \times \vec{B} = \mu_0 \vec{J} + \mu_0 \epsilon_0 \frac{\partial E}{\partial t}$$

Takeaway: All environments can use the trick to suppress numbering, or `\nonumber` can do this specifically per line. Although not shown in this demonstration, if equations get too long, or multiple equations should be given 1 equation number (such as an *if/else* statement), use the `\begin{split}` or `\begin{multiline}` environments.

2 Symbols

Greek symbols

Note that greek symbols that can be represented by english letters such as `\Alpha` and `\Chi` do not exists, as their symbols A and X are indistinguishable from using letters `$A$` and `$X$`. However, some packages override this behavior, so please check what math packages you import.

$$\alpha, A, \beta, B, \gamma, \Gamma, \delta, \Delta ... \mu, \nu$$

Equation symbols

You have control over all types of symbols relevant to mathematical, and even graphical representation. To get an extensive list please look here.

Formatting mathematical symbols

Some equations need more than a simple definition or symbol. Some symbols can be compounded to make more complex statements. For example

$$\sum_{i=\int\int\int}^{\overrightarrow{j=\widehat{AAA}}}$$

A more comprehensive discussion on this topic, and how to customize the look can be found here.

3 Spacing

Horizontal spacing is dictated by the document class font size (e.g. 11pt, 12pt, etc.) and is measured by *em* which is roughly proportional to the horizontal width of a capital M. To artificially create 1 em width is to use `\quad`. See:

A B
AMB (... a little bit more than M)

Knowing this, there are many commands such as `\,` `\:` that create fractions of `\quad`. The variety of commands for horizontal spacing in normal and math mode can be found here. There is also a discussion on which spacing is appropriate.