1 Text mode and math mode

This is a line

break.

This is not a line break.

This is centered text.

Use *italics* and **bold** text for emphasis. [1]

Here is a nice formula with superscripts: $x^n + y^n = z^n$. Longer formulas should be displayed:

$$\sum_{i=1}^{100} i^2 = \frac{100 \cdot 101 \cdot 201}{6}.$$

Formulas display differently in displayed and inline mode! The same thing in inline mode is: $\sum_{i=1}^{100} i^2 = \frac{100 \cdot 101 \cdot 201}{6}$. Anything with a $\sum$ or similar character should usually be displayed.

Text mode and math mode are entirely different! Commands and symbols that work in one may or may not work in the other. If you are in math mode and want to write text, use `\text`:

$$x = 3 \text{ and } y = 5$$

Note that spaces have to be explicitly included in the text environment. Math mode eats up spaces.

Also keep in mind that quotation marks must be written specially: "like this".

2 Special characters

As you have seen, backslash (\) is used to indicate a command in LaTeX. Backslash and other characters have a special meaning in LaTeX. These characters need to be escaped. To get the regular character, usually just add a backslash before it:

$ % & { } _

Some characters are a little more complicated (you will probably not need some of these characters):

^ \ ~

[1] This is a footnote.

3 Lists

There are two sorts of lists. Bulleted lists:

- This
- is
- a
- bulleted
- list.

Enumerated lists:

1. This
2. is
3. an
4. enumerated
5. list.

This description environment isn't really a list, but it's a useful way to informatively split a proof into clear components.

Reflexivity Proof that the relation is reflexive...

Symmetry Proof that the relation is symmetric...

Transitivity Proof that the relation is transitive...

4 More symbols and useful commands

Here are some useful math mode fonts:

$$\mathbb{Z}^+ \quad \mathbb{Q} \quad \mathbb{R} \quad \mathcal{P}$$

Important commands:

$$\frac{22}{7} + \sqrt{22+7} + \binom{22}{7}$$

Use left and right parentheses correctly for big expressions:

$$x = f\left(1 + \frac{1}{1 + \frac{1}{1}}\right)$$

This can be done with other types of delimiters:

$$x = \left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}\right\}$$

Quantifiers:

$$\forall \quad \exists$$

Set stuff:

$$\in \quad \notin \quad \subseteq \quad \supseteq \quad \nsubseteq \quad \varnothing \quad \cup \quad \cap \quad \{x \in \mathbb{N} \mid x \leq 5, x \geq 2\}$$

Miscellaneous:

$$\times \quad \to \quad \ldots \quad \cdots$$

Will be useful later:

$$\neg \quad \vee \quad \wedge \quad 10 \equiv 3 \pmod 7 \quad \implies \quad \iff$$

5 More on Typesetting Math

In addition to inline math and display math, there is aligned math:

$$\begin{aligned} x &= 3(5y + 10) && (1)\\ &= 3 \cdot (5y) + 3 \cdot 10 && (2)\\ &= 15y + 30 && (3) \end{aligned}$$

Notice that numbers automatically appear next to each line in the align environment. This makes it super convenient to refer to results you've already typed up! Be careful though: all numbers automatically shift if you delete a line of the equation.

If you want to get rid of the numbers, use the align* environment:

$$\begin{aligned} x &= 3(5y + 10) \\ &= 3 \cdot (5y) + 3 \cdot 10 && \text{by the distributive property} \\ &= 15y + 30 \end{aligned}$$

Notice how we added a little note to justify a particular line. If you include another &, the align environment will place what comes after in another column.

If you want to number a single equation, you can't do so in normal display math mode. What you want is the equation environment:

$$x = A \times B \tag{4}$$

Notice how the numbering picks up right where we left off!

This is the proof environment:

Proof. This is a proof. □

6 Other

You can include graphics with the 'includegraphics' package.

You can also create custom commands, provided they don't already exist. Check out the shortcut for the set of integers, defined at the very top of the LaTeX:

$$\mathbb{Z}$$

You can also create custom commands that take in a certain number of arguments:

$$\sum_{1}^{n} i$$