

# Common L<sup>A</sup>T<sub>E</sub>X commands for MATH 294

## 1 Math mode

There are two primary math modes:

For *inline* math mode, put dollar signs \$ around the text:  $\$f(x) = x^2\$$  becomes  $f(x) = x^2$ .

For *displayed* math mode, put \[ before and \] after the text:  $\[ f(x) = x^2 \]$  becomes

$$f(x) = x^2$$

The `align` environment is useful for writing multiple lines where certain symbols should line up between lines. To do this, put your text in between a `\begin{align*}` and a `\end{align*}` (the `*` makes it so LaTeX doesn't add numbering to each line). A double backslash `\` will create start a new line, and an ampersand `&` tells LaTeX where to align each line.

For example,

```
\begin{align*}
  f(x) &= (x+1)^2 \\
  &= x^2 + x + x + 1 \\
  &= x^2 + 2x + 1
\end{align*}
```

becomes

$$\begin{aligned} f(x) &= (x + 1)^2 \\ &= x^2 + x + x + 1 \\ &= x^2 + 2x + 1 \end{aligned}$$

## 2 Text formatting

To **bold** text, place the text in between the curly braces of `\textbf{}`: `\textbf{bold}` becomes **bold**.

To *italicize* text, place the text in between the curly braces of `\textit{}`: `\textit{italics}` becomes *italics*.

### 2.1 Formatting in math mode

Formatting in math mode works a little differently, and there are some things that can only be done in math mode.

All spaces and line breaks are ignored in math mode:  $\$f(x)=x^2\$$  and  $\$f(x) = x^2\$$  give the same output:  $f(x) = x^2$  and  $f(x) = x^2$  look the same;

```
\[ f(x) = x^2 \]
```

and

```
\[
f(x) =
x^2
\]
```

give the same output:

$$f(x) = x^2$$

and

$$f(x) = x^2$$

look the same.

To do superscripts, use a caret `^`, while to do subscripts, use an underscore `_`: `$x^2$` becomes  $x^2$ , `$x_1$` becomes  $x_1$ .

Note that superscripts and subscripts will only work for one character; if you want to have a longer superscript or subscript, enclose the entire superscript/subscript in curly braces `{}`: `$x^{2n+1}$` becomes  $x^{2n+1}$  (not good!), while `$x^{2n+1}$` becomes  $x^{2n+1}$  (good!).

### 3 Commonly used symbols

All symbols must be done in math mode.

- Not equals: `\neq` becomes  $\neq$
- Less than or equals to and greater than or equals to: `\leq` becomes  $\leq$ , `\geq` becomes  $\geq$
- Times: `\times` becomes  $\times$
- Slashes: use `\not` before any math mode command to put a slash through it. For example, `\not\mid` becomes  $\nmid$
- “Math blackboard”: `\mathbb{letter}` gives a version of the letter with an extra line, commonly used for sets like natural numbers and integers. For example,
  1. `\mathbb{N}` becomes  $\mathbb{N}$  (natural numbers)
  2. `\mathbb{Z}` becomes  $\mathbb{Z}$  (integers)
  3. `\mathbb{Q}` becomes  $\mathbb{Q}$  (rational numbers)
  4. `\mathbb{R}` becomes  $\mathbb{R}$  (real numbers)
- “Math calligraphic”: `\mathcal{letter}` gives a calligraphic version of the letter. For example, `\mathcal{A}` gives  $\mathcal{A}$ .

### 4 Logical symbols

All logical symbols must be done in math mode.

- And: `\and` becomes  $\wedge$
- Or: `\lor` becomes  $\vee$
- Not: `\neg` becomes  $\neg$
- Implies: `\Rightarrow` becomes  $\Rightarrow$ , `\implies` becomes  $\implies$
- If and only if: `\Leftrightarrow` becomes  $\Leftrightarrow$ , `\iff` becomes  $\iff$

- For all: `\forall` becomes  $\forall$
- There exists: `\exists` becomes  $\exists$

## 5 Symbols related to sets

All set-related symbols must be done in math mode.

- Curly braces: `\{` and `\}` become  $\{$  and  $\}$
- Ellipses: `\dots` becomes  $\dots$
- Vertical bars: `\mid` becomes  $|$
- Element of: `\in` becomes  $\in$ , `\notin` becomes  $\notin$
- Subset/superset: `\subseteq` becomes  $\subseteq$ , `\subset` becomes  $\subset$ , `\subsetneq` becomes  $\subsetneq$   
`\supseteq` becomes  $\supseteq$ , `\supset` becomes  $\supset$ , `\supsetneq` becomes  $\supsetneq$   
`\not\subseteq` becomes  $\not\subseteq$ , and similarly for all variants of subset/superset
- Empty set: `\varnothing` becomes  $\emptyset$ . You can also use `\emptyset` to get  $\emptyset$ , but I prefer `\varnothing`.
- Intersection: `\cap` becomes  $\cap$
- Union: `\cup` becomes  $\cup$
- Relative complement: `\setminus` becomes  $\setminus$
- Power set: `\mathcal{P}(X)` becomes  $\mathcal{P}(X)$
- Indexed intersections and unions: `\bigcap_{i \in I} X_i` becomes  $\bigcap_{i \in I} X_i$ , `\bigcup_{i \in I} X_i` becomes  $\bigcup_{i \in I} X_i$ .

Indexed intersections and unions look better in displayed mode, since it will move the indexing to under the symbol. The same commands as above in displayed mode show up as:

$$\bigcap_{i \in I} X_i \quad \text{and} \quad \bigcup_{i \in I} X_i$$

- Cartesian product: use `\times` for Cartesian products:  $A \times B$ .
- Indexed Cartesian products: `\prod_{i \in I} X_i` becomes  $\prod_{i \in I} X_i$ . Like indexed intersections and unions, indexed Cartesian products look better in displayed math mode:

$$\prod_{i \in I} X_i$$

## 6 Lists

To start a numbered list, place the text between `\begin{enumerate}` and `\end{enumerate}`, and use `\item` to start a new item in the list:

```
\begin{enumerate}
  \item this is the first item

  this is some text between item 1 and item 2

  \item this is the next item
\end{enumerate}
```

becomes

1. this is the first item  
    this is some text between item 1 and item 2
2. this is the next item

You can also nest numbered lists automatically:

```
\begin{enumerate}
  \item \begin{enumerate}
    \item this is item 1.(a)
    \item this is item 1.(b)
  \end{enumerate}
  \item this is item 2
\end{enumerate}
```

becomes

1. (a) this is item 1.(a)  
    (b) this is item 1.(b)
2. this is item 2