Some examples of \TeX

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1. Math symbols are enclosed by dollar signs, in two ways. If you type

$$
\lim_{x\to\infty} f(x) = \pi.
$$

it comes out displayed as

$$
\lim_{x\to\infty} f(x) = \pi.
$$

2. If you type

\$\lim_{x\to\infty} f(x) = \epsilon.\$

it comes out undisplayed as \(\lim_{x\to\infty} f(x) = \epsilon.\)

3. If you type

$$
\int_0^{3/2} x^2 \ dx = \frac{9}{8}
$$

it comes out as

\[ \int_0^{3/2} x^2 \ dx = \frac{9}{8}. \]

Here the \(\backslash\) before the \(\text{dx}\) puts a little space before the \(\text{dx}\), which looks better. Generally, the \(\backslash\) sign indicates a command, like

\$\int$
is the command for $\int$. Likewise, $\backslash$ (with a space after the $\backslash$) is a command for a bit of space. If you want more space, use $\backslash$quad:

$$
\int_0^{3/2} x^2 \quad \text{dx} = \frac{9}{8}
$$
gives

$$
\int_0^{3/2} x^2 \quad \text{dx} = \frac{9}{8},
$$
which doesn’t look too good.

4. If you type

$$
\cup, \bigcup, \cap, \bigcap, \subset, \subseteq, \supset, \supseteq
$$
You get

$$
\cup, \bigcup, \cap, \bigcap, \subset, \subseteq, \supset, \supseteq
$$
You can put limits on these:

$$
S = \bigcap_{n=1}^{\infty} \left( 1 - \frac{1}{n}, 1 + \frac{1}{n} \right) = [0, 1]
$$
gives

$$
S = \bigcap_{n=1}^{\infty} \left( 1 - \frac{1}{n}, 1 + \frac{1}{n} \right) = [0, 1].
$$

The commands

$$
\left( \quad \right)
$$
tell $\LaTeX$ to adjust the size of parentheses to the fractions, as it sees fit.

5. If you type
\[
S = \{\cos\left(\frac{n\pi}{3}\right) : n \in \mathbb{N}\}
= \left\{\pm 1, \pm \frac{1}{2}, \pm \frac{\sqrt{3}}{2}\right\}
\]

you get
\[
S = \{\cos\left(\frac{n\pi}{3}\right) : n \in \mathbb{N}\} = \left\{\pm 1, \pm \frac{1}{2}, \pm \frac{\sqrt{3}}{2}\right\}
\]

Note the unadjusted parentheses in the \(\cos\) (because we used plain old \((\))\), and the adjusted brackets in the right side (because we used \([\) and \(])\). Also the command \(\text{\texttt{bn}}\) is a “macro” for the symbol \(\mathbb{N}\). This a made-up abbreviation for the real command

\(\text{\texttt{mathbb}}\ \mathbb{N}\)

which was given at the top of the source file (see 7. below). “\(\text{\texttt{mathbb}}\)” is a font called “blackboard bold” which you can use for any English letter. Other fonts:

\[
\text{\texttt{mathcal}} \ N, \ \text{\texttt{mathsf}} \ N, \ \text{\texttt{mathfrak}} \ N, \ \text{\texttt{mathbf}} \ N
\]
give
\[
\mathcal{N}, \mathsf{N}, \mathfrak{N}, \mathbf{N}
\]

These can only be used in math mode (inside the dollar signs). If you want bold outside math mode, in regular text, use \(\text{\texttt{bf}}\) inside \{\ldots\}. For example:

\textbf{6.} To get this \textbf{6.} in bold, with space above it, not indented, and with a bit of space after it, you can type

\texttt{vskip10pt\noindent}{\textbf{6.}}

This is useful for numbering homework problems. The \(\text{\texttt{bf}}\) command is confined within the brackets \{\}. Without the brackets, the rest of the file after the \(\text{\texttt{bf}}\) would be in bold. Generally, \{\}, without any backslashes, is used to confine commands, and does not appear in the output. If you want curly brackets in the output,

\[
\{\cdots\}
\]

will give \{\ldots\}, as in example 5 above.

\textbf{7.} You can invent new macros, as I did in the homework template. Here are two of them:
\newcommand{\proof}{\par\noindent{\bf Proof:\ } \}}
\newcommand{\qed}{$\blacksquare$}

Now, if you type \proof, you get
\textbf{Proof:} (bold, new line, not indented) and if you type \qed, you get ■, to indicate
the end of a proof.