

College of the Holy Cross Getting Started with L^AT_EX

1 A Short L^AT_EX File

The activities below guide you through basic typesetting in L^AT_EX. Open `emacs` and create a file that starts:

```
\documentclass[12pt]{article}
\usepackage{latexsym,amsmath}

\begin{document}
\end{document}
```

(You may add additional blank lines to make the file easier to read. Everything will be typed between the commands that start and end the document, so you'll want a few blank lines there.) These commands set the document in 12-point type ("pica") and include some extra functionality (the `latexsym` and `amsmath` packages). Otherwise, you'll be typing in vanilla L^AT_EX. When you run `lATEX` today, use the `-v` option, which causes L^AT_EX's errors (and other output messages) to print on the screen.

1.1 Fonts and special characters

L^AT_EX more or less typesets whatever ordinary text you type, though a few characters, including `#`, `$`, `%`, `&`, `{`, and `}`, have special meanings to L^AT_EX and must be preceded by a backslash in the input file.

Exercise 1 Typeset the following sentence:

It cost \$2.50 for the #1 size, which holds 50% more.

Exercise 2 Leave out the backslashes one by one and see what L^AT_EX does.

Fonts such as *italic*, **bold**, and `typewriter`, are created with special tags:

```
\textit{italic}, \textbf{bold}, and \texttt{typewriter}
```

Italics are primarily used to *emphasize* text. The command `\emph{}` emphasizes the text between the braces. You should use this command habitually for italics, since different environments regard emphasis differently. Generally, it's best to avoid any hard-coded use of fonts. We'll see later how to use fonts flexibly.

Exercise 3 Typeset the sentence

"I am **not** going, and that's *final*," she typed into `emacs`.

Exercise 4 What happens if you put emphasized text inside an emphasis?

1.2 Math Mode

Mathematical typesetting obeys different rules than ordinary typesetting. To mark short snippets of mathematics, enclose them with dollar signs:

```
$_alpha^2+_beta_3 = \zeta(4) \leq \frac{\pi^2}{4}$.
```

Exercise 5 Guess what the snippet does, then typeset it to check.

Exercise 6 Leave off one or both dollar signs and see what happens.

Exercise 7 Typeset the following:

The *Pythagorean theorem* asserts that if a , b , and c are the legs and hypotenuse of a right triangle, then $a^2 + b^2 = c^2$.

Exercise 8 Typeset the sentence

Let $a = t_0 < t_1 < t_2 < \cdots < t_n = b$, and assume $x_i \in [t_{i-1}, t_i]$ for $i = 1, \dots, n$.

Hints: There are two different ellipses, `\cdots` and `\ldots` (“centered” and “low”), the element sign is `\in`, and subscripts longer than a single character must be enclosed in curly braces.

Exercise 9 Is typesetting “difference” in italics the same as putting the word in math mode?

1.3 Displayed Equations

Larger or more complicated mathematical expressions and equations should often be *displayed*, set off in the middle of a line by themselves. The most basic displayed math environment is `begin` and ended with the commands `\[` and `\]`. It’s a good idea to put these commands on their own lines to make them easy to find, but don’t leave blank lines before or after them.

Sometimes you want to put ordinary text in a mathematical display. The `\text{}` environment does this. (This environment is defined by the `amsmath` package, so your document preamble must contain an appropriate “`usepackage`” line.)

Exercise 10 Typeset:

If f is continuous on $[a, b]$, then

$$\frac{d}{dx} \int_a^x f(t) dt = f(x) \quad \text{for all } x \text{ in } [a, b].$$

Hints: An integral sign is made with `\int`; the limits are sub- and super-scripts. Use a `\,` to get the thin space before the dt , and `\quad` to get the wide space between the integral and the following text.

Exercise 11 Typeset:

$$\int_0^x e^{-t^2} dt = \sum_{k=0}^{\infty} \frac{(-1)^k x^{2k+1}}{(2k+1)k!} = x - \frac{x^3}{3} + \frac{x^5}{5 \cdot 2!} - \frac{x^7}{7 \cdot 3!} + \cdots$$

Hints: `\sum` makes a summation sign; the lower and upper limits are sub- and super-scripts. `\infty` is infinity and `\cdot` is a single dot. To get a fraction with a horizontal bar, use `\frac{num}{denom}`. Finally, don’t forget that multi-character sub- and super-scripts must be enclosed in curly braces.

Exercise 12 Typeset the Fourier inversion formula:

$$\text{If } \widehat{f}(n) = \int_0^{2\pi} f(x) e^{-inx} dx, \text{ then } f(x) = \sum_{n=-\infty}^{\infty} \widehat{f}(n) e^{inx}.$$

Hints: `\widehat{}` puts a hat accent over its argument, Greek letters are obtained by name (e.g., “`\alpha`”), and inter-word spaces in a displayed equation appear if they are enclosed in a “`\text`” environment.