

An example of basic mathematics typesetting in L^AT_EX:

To solve

$$\frac{dy}{dx} + \frac{3}{x}y = x^4, \quad y_0 = \sqrt{2}, \quad (1)$$

we use the *integrating factor* $\rho(x) = e^{\int p(x) dx}$ (where $p(x)$ is the coefficient of y in (1)). This is

$$\begin{aligned} \rho(x) &= e^{\int (3/x) dx} = e^{3 \ln |x|} \\ &= x^3 \text{ (because } 3 \ln |x| = \ln |x|^3 \text{)}. \end{aligned} \quad (2)$$

... Finally, we might ask: what is $\lim_{x \rightarrow \infty} \sqrt[n]{y(x)}$, $n \in I$, $n \neq 2$?

```
\documentclass{article}
\usepackage{amsmath} % we need this for the align macro
\begin{document}
To solve
\begin{equation}\label{E:linde}
\frac{dy}{dx}+\frac{3}{x}y = x^4, \quad y_0=\sqrt{2},
\end{equation}
we use the \emph{integrating factor}  $\rho(x) = e^{\int p(x)\,dx}$  (where  $p(x)$  is the coefficient of  $y$  in
\ref{E:linde}). This is
\begin{align}
\rho &= e^{\int (3/x)\,dx} = e^{3\ln|x|}\notag\ \\
&= x^3 \quad (\mbox{because } 3\ln|x|=x^3).
\end{align}
\ldots Finally, we might ask: what is
 $\lim_{x \to \infty} \sqrt[n]{y(x)}$ ,  $n \in I$ ,  $n \neq 2$ ?
\end{document}
```

Some things to note about this:

- *Inline math* equations are delimited with \dots .
- *Displayed math* equations are delimited in a number of ways: to get a numbered equation, use `\begin{equation}... \end{equation}`. To get a simple, unnumbered equation, replace `equation` with `equation*` in the `begin` and `end` macros¹. To get multi-line equations, we use something like `align` (see below).

¹The `equation*` and `align` equation environments require that you load the `amsmath` package with the `\usepackage{amsmath}` command included in the document header. If you're not using this package, you can also get an unnumbered displayed equation by using `\[` and `\]` instead of the `\begin{equation*}` and `\end{equation*}` commands.

- By using the `\label` macro, we can “label” an equation displayed with `\equation` and refer to it later with the `\ref` command. Note that in our example we didn’t label equation (2)², but still let it get numbered.
- All spaces are ignored in equations. To specify spacing other than that which L^AT_EX puts in, we have to specify it. Spacing commands are `\`, `(\)`, `\:` `(\)`, `\;` `(\)`, `\quad` `(\)`, and `\qquad` `(\)`. But usually you can trust L^AT_EX to get things right.
- To include text in math, use `\mbox{...}` to avoid it being typeset in *mathitalic* (with no spaces).
- Greek symbols are available in math as you’d expect, through the macros `\alpha`, `\beta`, . . . (And in capitals, too(!): `\Gamma`, . . .)
- Include standard operators and functions in math with the corresponding L^AT_EX commands: `\in`, `\ln`, `\ne`, `\sin`, `\to`, *etc.*
- Finally, notice the `align` equation environment³. This allows alignment of several equations—the marker that indicates where the alignment takes place is the ampersand.
 - Each of the equations in the `align` environment (*except the last*) is ended with a line break (`\\`).
 - By default each of the equations is individually numbered, but we can suppress numbering on one or more of the equations with the `\notag` command. (Inserted before the `\\`.)
 - We can also label any numbered equation with a `\label` command, the same way we labelled the first equation—for example, by appending `\label{E:intfac}` at the end of the equation (before the `\\` if we’re not labelling the last equation).

² . . . sort of.

³Which requires the `amsmath` package—see footnote 1.