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LaTeX

3.1 TeX and Latex

Donald Knuth invented TeX when he found that publishers could not suitably format the equations of a book he was writing. Instead of copywriting TeX, he released it free to the public in 1978. In 1985, Leslie Lamport added macros that made TeX easier to use, and described them in his book *Latex* (Lamport, 1994). Latex has become the standard way to write physics and math papers.

Latex runs on Linux, Mac OS, and Windows, and also is available online. The Latex Project `www.latex-project.org/get` is a good place to start.

If you want to run Latex on your own computer so you can use it when you are not connected to the internet, then you should download the free distribution of Latex that is appropriate for your operating system. If you run Linux, then you should download and install the TeX Live distribution `www.tug.org/texlive`. If you run Mac OS, you should download and install the MacTeX distribution `www.tug.org/mactex`. If you run Windows, you have a choice of three distributions—MikTeX `miktex.org`, proTeXt `www.tug.org/protext`, and TeX Live `www.tug.org/texlive`.

Once you have Latex installed, you probably should get a good editing program. Some editors are very good, and most are free. I will list only the free ones that I have heard good things about. TeXstudio `www.texstudio.org` and TeXworks `www.tug.org/texworks` run on all major operating systems. TeXShop `pages.uoregon.edu/koch/texshop` runs only on Mac OS and was the model for TeXworks.

As far as I know, the better online Latex programs are not free or cheap. The best known such program is Overleaf `www.overleaf.com` which costs $10 per month or $15 if you want all the premium features. Frankly, I rec-

ommend you download Latex and a good editor and skip Overleaf and other pricey programs.

Installing Latex on a Chromebook involves several steps. You probably should first install Linux `support.google.com/chromebook/answer/9145439?hl=en`. Then you can follow the steps mentioned above for how to install Latex on a Linux system. Alternatively, you could try `github.com/macbuse/Chromebook/blob/master/LaTeX.md`.

3.2 Automatic Numbering

Display equations are important parts of most physics papers. We usually number our equations to make them easy to find. Latex numbers them automatically. For instance,

```
The range $\lambda_{L} = h /m_L c$ of
the corresponding Yukawa potential is
\begin{equation}
\lambda_L > 4.5 \times 10^{-7} \, \text{m}.
\label{range of potential}
\end{equation}
```

formats the equation with its number:

The range $\lambda_L = h/m_L c$ of the corresponding Yukawa potential is

$$\lambda_L > 4.5 \times 10^{-7}\,\text{m}. \tag{7}$$

In the manuscript of a book, the script

```
\begin{equation}
f^{(n)}(z) ={}  \frac{n!}{2\pi i} \,
\oint \, dz' \, \frac{f(z')}
{(z' - z)^{n+1}} .
\label {f(n)}
\end{equation}
```

produces the numbered equation

$$f^{(n)}(z) = \frac{n!}{2\pi i} \oint dz' \, \frac{f(z')}{(z'-z)^{n+1}} \tag{3.1}$$

in which the number of the chapter is followed by the number of the equation. Articles usually don't have chapters, so in the manuscript of an article only the number of the equation appears as in the case (7) of the Yukawa potential. One may avoid numbering an equation by adding an asterisk:

```
\begin{equation*}
f^{(n)}(z) ={}  \frac{n!}{2\pi i} \,
\oint \, dz' \, \frac{f(z')}
{(z' - z)^{n+1}} .
\label {f(n)}
\end{equation*}
```

which makes the display equation

$$f^{(n)}(z) = \frac{n!}{2\pi i} \oint dz' \, \frac{f(z')}{(z' - z)^{n+1}}$$

without a number.

The advantage of numbering one's equations is that one can refer to them for instance by writing

```
Cauchy's integral formula (\ref{f(n)}) gives us
the \(n\)th derivative \(f^{(n)}(z)\) of
the function \( f(z)\) at the point \(z\).
```

we get

Cauchy's integral formula (3.1) gives us the nth derivative $f^{(n)}(z)$ of the function $f(z)$ at the point z.

3.3 Give Your Readers a Break

Some writers take undue advantage of numbered equations, writing sentences like,

Combining (5), (14), and (39), one gets ...

forcing readers to search the paper for these equations. Writers who care about their readers write instead,

Combining the definition (5) of the Gamma function with our formulas for the flux (14) and the cross-section (39), we get ...

So try to describe each equation you refer to, as in

Cauchy's integral formula (3.1) gives

rather than

Eq. (3.1) gives .

Your papers will be easier to read.