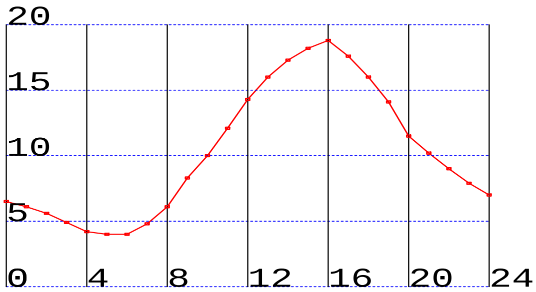

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Isaac Newton
Cambridge University
Cambridge, England

Dear Isaac,

I wanted to send you some sample equations and graphics to show how well the LaTeX program works. If I had a color printer you would be getting a color version of the graphic, which was generated with MapleV5, a mathematical problem solving language.

To start with, inline mathematics is typeset between $ symbols, so that

`$1 + 2 + \cdots + n = \frac{n (n+1)}{2}$` produces $1+2+\cdots+n=\frac{n(n+1)}{2}$. On the other hand, you can display the equation by using `\[` and `\]`, as in

$$1+2+\cdots+n=\frac{n(n+1)}{2}.$$

Subscripts and superscripts are easy in LaTeX: `$a_1$` turns into a_1 and `$a^{12}$` turns into a^{12}.

Integral and derivative symbols are available in LaTeX: So the integral of $f(x)$ from a to b would be $\int_a^b f(x)\,dx$, and the derivative of $f(x)$ would be $\frac{\partial f}{\partial x}$. The displayed versions of these are

$$\int_a^b f(x)\,dx \quad \text{and} \quad \frac{\partial f}{\partial x}.$$

Notice how the displayed symbols are larger than the inline symbols? You can make the inline symbols larger by inserting a `\displaystyle`. So a big inline integral is $\displaystyle\int_a^b f(x)\,dx$.

We used the command *newcommand* to define an theorem environment in the preamble of this letter, so we can number theorems automatically.

What is the Pythagorean theorem?

Theorem 1 (Pythagoras) *If* $\triangle ABC$ *is a right triangle with hypotenuse* $\overline{AB}$*, then* $AB^2 = AC^2 + CB^2$

How about tables and matrices? They can be handled in LaTeX with no problem. Here's a piecewise defined function.

$$y = \begin{cases} 2x+1 & \text{if } x < 3 \\ \sqrt{x^2 - \frac{2}{3}x} & \text{if } 3 \leq x < 10 \\ \exp\sin(3x+1) & \text{if } x \geq 10 \end{cases}$$

Now theorem 1 has been stated. The binomial symbol $\left(\begin{array}{c} n \\ i \end{array} \right)$ is typeset with the `\binom` macro defined in the preamble. This makes it easier to state the binomial theorem.

Theorem 2 (The Binomial Theorem) *Let n and i be integers with $n > 2$ and $1 < i < n$. Then $\left(\begin{array}{c} n \\ i \end{array} \right)$, the coefficient of $x^{n-i}y^i$ in the expansion of $(x+y)^n$, is the sum of the coefficients of $x^{n-i}y^{i-1}$ and $x^{n-i-1}y^i$ in the expansion of $(x+y)^{n-1}$. That is,*

$$\left(\begin{array}{c} n \\ i \end{array} \right) = \left(\begin{array}{c} n-1 \\ i-1 \end{array} \right) + \left(\begin{array}{c} n-1 \\ i \end{array} \right)$$

Proof: We induct on n. The statement is true if $n = 3$ and $i = 2$. Suppose it is true for $n-1$ and all i between 1 and $n-1$. We can write $(x+y)^n = (x+y)(x+y)^{n-1} = x(x+y)^{n-1} + y(x+y)^{n-1}$. By induction, yada yada yada ....

Tables are easy to make up too with the `\begin{tabular}` character style. Here is a short four line table of LaTeX symbols and what they typeset to.

Table of LaTeX symbols

LaTeX symbol	`$\alpha $`	`$\pi$`	`$\sum_{i=1}^{\infty} $`	`$\triangle $`
typesets to	α	π	$\sum_{i=1}^{\infty}$	$\triangle$
LaTeX symbol	`$ \not\cong$`	`$\aleph$`	`$\clubsuit $`	`${\cal A}$`
typesets to	$\not\cong$	$\aleph$	$\clubsuit$	$\mathcal{A}$

So, aren't you jealous, Isaac? If you had access to LaTeX in your day, it wouldn't have taken 20 years to get the *Principia* into print. You could have typed it as you went.

Sincerely,

Carl Eberhart