LaTeX for Undergraduates
Introduction
Lecture Notes

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Example Document

This output is an excerpt from a sample document written by Harvey Gould. To view the source code, return to the website and open the `.txt` file.

1 Output

Introduction to LaTeX
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2 Introduction

TeX looks more difficult than it is. It is almost as easy as π. See how easy it is to make special symbols such as α, β, γ, δ, $\sin x$, $\hbar$, λ, ... We also can make subscripts A_x, A_{xy} and superscripts, e^x, e^{x^2}, and e^{a^b}. We will use LaTeX, which is based on TeX and has many higher-level commands (macros) for formatting, making tables, etc. More information can be found in Ref. [1].

We just made a new paragraph. Extra lines and spaces make no difference. Note that all formulas are enclosed by $ and occur in *math mode*.

The default font is Computer Modern. It includes *italics* or *italics*, **boldface** or **boldface**, *slanted* or *slanted*, and `monospaced` or `monospaced` (typewriter) fonts.

3 Equations

Let us see how easy it is to write equations.

$$\Delta = \sum_{i=1}^{N} w_i (x_i - \bar{x})^2. \tag{1}$$

It is a good idea to number equations, but we can have a equation without a number by writing

$$P(x) = \frac{x-a}{b-a},$$

and

$$g = \frac{1}{2}\sqrt{2\pi}.$$

Note the different ways of writing a ratio.

We can give an equation a label so that we can refer to it later.

$$E = -J\sum_{i=1}^{N} s_i s_{i+1}, \tag{2}$$

Equation (2) expresses the energy of a configuration of spins in the Ising model.[1]

We can define our own macros to save typing. For example, suppose that we introduce the macros:

```
\newcommand{\lb}{{\langle}}
\newcommand{\rb}{{\rangle}}
```

Then we can write the average value of x as

```
\begin{equation}
\lb x \rb = 3
\end{equation}
```

The result is

$$\langle x \rangle = 3. \tag{3}$$

Examples of more complicated equations:

$$I = \int_{-\infty}^{\infty} f(x)\,dx. \tag{4}$$

We can do some fine tuning by adding small amounts of horizontal spacing:

```
\, small space        \! negative space
```

as is done in Eq. (4).

We also can align several equations:

$$a = b \tag{5}$$
$$c = d, \tag{6}$$

or number them as subequations:

$$a = b \tag{7a}$$
$$c = d. \tag{7b}$$

[1] It is necessary to process (typeset) a file twice to get the counters correct.

We can also have different cases:

$$m(T) = \begin{cases} 0 & T > T_c \\ \left(1 - [\sinh 2\beta J]^{-4}\right)^{1/8} & T < T_c \end{cases} \tag{8}$$

write matrices

$$\begin{aligned} \mathbf{T} &= \begin{pmatrix} T_{++} & T_{+-} \\ T_{-+} & T_{--} \end{pmatrix}, \\ &= \begin{pmatrix} e^{\beta(J+B)} & e^{-\beta J} \\ e^{-\beta J} & e^{\beta(J-B)} \end{pmatrix}. \end{aligned} \tag{9}$$

and

$$\sum_i \vec{A} \cdot \vec{B} = -P \int \mathbf{r} \cdot \hat{\mathbf{n}}\, dA = P \int \vec{\nabla} \cdot \mathbf{r}\, dV. \tag{10}$$

4 Tables

Tables are a little more difficult until you get the knack. TeX automatically calculates the width of the columns.

lattice	d	q	T_{mf}/T_c
square	2	4	1.763
triangular	2	6	1.648
diamond	3	4	1.479
simple cubic	3	6	1.330
bcc	3	8	1.260
fcc	3	12	1.225

Table 1: Comparison of the mean-field predictions for the critical temperature of the Ising model with exact results and the best known estimates for different spatial dimensions d and lattice symmetries.

5 Lists

Some example of formatted lists include the following:

1. bread
2. cheese

- Tom
- Dick

References

[1] Helmut Kopka and Patrick W. Daly, *A Guide to LaTeX: Document Preparation for Beginners and Advanced Users*, third edition, Addison-Wesley (1999).

[2] Some useful links are given at `<http://sip.clarku.edu/tutorials/TeX/>`.