

1 Introduction

T_EX (a special symbol) looks more difficult than it really 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 L^AT_EX, which is based on T_EX and has many higher-level commands (macros) for formatting, making tables, etc.

We just made a new paragraph. Extra lines and spaces make no difference. Note that all formulae 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.

2 Equations

Let us see how easy it is to write equations.

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

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

$$P(x) = \text{frac}x - ab - a.$$

or

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

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

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

Equation (2) expresses the energy of a configuration of spins.¹

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

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

¹It is necessary to process a file twice to get the counters correct.

Then we can write the average value of x as

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

The result is

$$\langle x \rangle = 3. \quad (3)$$

Examples of more complicated equations:

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

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

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

as is done in (4).

We also can align several equations:

$$a = b \quad (5)$$

$$c = d, \quad (6)$$

or number them as subequations:

$$a = b \quad (7a)$$

$$c = d. \quad (7b)$$

We can also have different cases:

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

write matrices

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

and

$$\sum_i \vec{A} \cdot \vec{B} = -P \int \mathbf{r} \cdot \hat{\mathbf{n}} dA = P \int \vec{\nabla} \cdot \mathbf{r} dV \quad (10)$$

3 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.

4 Lists

Some example of formatted lists include the following:

1. bread
 2. cheese
- Tom
 - Dick

5 Literal text

It is desirable to print program code exactly as it is typed in a monospaced font. Use `\begin{verbatim}` and `\end{verbatim}` as in the following example:

```
public void computeArea()
{
    this.area = this.length*this.length;
    System.out.println("Area = " + this.area);
}
```

The command `\verbatiminput{programs/Square.java}` will allow you to list the file Square.java in the directory programs.

6 Special Symbols

6.1 Common Greek letters

These commands may be used only in math mode. Only the most common letters are included.

$\alpha, \beta, \gamma, \Gamma, \delta, \Delta, \epsilon, \zeta, \eta, \theta, \Theta, \kappa, \lambda, \Lambda, \mu, \nu, \xi, \Xi, \pi, \Pi, \rho, \sigma, \tau, \phi, \Phi, \chi, \psi, \Psi, \omega, \Omega$

6.2 Special symbols

The derivative is defined as

$$\frac{dy}{dx} = \lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x} \quad (11)$$

$$f(x) \rightarrow y \quad \text{as } x \rightarrow x_0 \quad (12)$$

$$f(x) \xrightarrow{x \rightarrow x_0} y \quad (13)$$

Order of magnitude:

$$\log_{10} f \simeq n \quad (14)$$

$$f(x) \sim 10^n \quad (15)$$

Approximate equality:

$$f(x) \simeq g(x) \quad (16)$$

\TeX is simple if we keep everything in proportion:

$$f(x) \propto x^3. \quad (17)$$

Finally we can skip some space by using a command such as

```
\bigskip \medskip \smallskip  
\vspace{space}
```

The space can be negative.

7 Figures

Figure 1 is an eps file.

Figure 1: Show me a sine.

8 References

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