

# L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> Introduction <sup>\*</sup>

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<sup>1</sup>sample\_footnote.1

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### Abstract

You can learn very basics of using  $\text{\LaTeX}$  2 $\epsilon$  as well as some advanced mathematical applications.

## 1 Basics

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## 1.1 Pages

New page

## 1.2 Lines

Going off the right edge of the paper → These strings and numbers (21312903) will be grouped together

‘New line’

“New line”

## 1.3 Hyphenation

Single-hyphenation

Double-hyphenation

Triple—hyphenation

Minus sign: −1

## 1.4 Internet links

[https://github.com/kwb425/EMCS\\_Git\\_Latex\\_Introduction.git](https://github.com/kwb425/EMCS_Git_Latex_Introduction.git)

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## 1.5 End of sentences

Sentence end with CAPITALS. Next Sentence. . .

## 1.6 Cross-reference

[1.6](#) on page [3](#)

## 1.7 Footnotes<sup>2</sup>

footnote<sup>3</sup>

## 1.8 Emphasizing

Three methods are **bold**, *italic*, and underline.

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<sup>2</sup>sample\_footnote\_1

<sup>3</sup>sample\_footnote\_2

## 1.9 Alignment

center alignment

left alignment

right alignment

## 1.10 Enumerates & Items & Descriptions

1. Sample\_enumerate\_1

- Sample\_item\_1
- Sample\_item\_2

2. Sample\_enumerate\_2

**Sample\_description\_1** is a sample.

## 1.11 Quatation

Below is sample quatation.

This sample is written by Kim, Wiback

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## 1.12 Raw printing

Raw printing /~!@#\$%^&\*()\_+

## 1.13 Tables

1st row	bound	1st sample	bound	1st sample
2nd row	bound	2nd sample	bound	2nd sample
3rd row	bound	3rd sample	bound	3rd sample
Pi	bound	Value & Rounding		
$\pi$	bound	3.1416	bound	3
$\pi^\pi$	bound	36.46	bound	36
$(\pi^\pi)^\pi$	bound	80662.7	bound	80663

## 1.14 Floats

## 2 Mathematical equations

### 2.1 Inline equations

$$a^x + y \neq a^{x+y}$$

$$\lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{1}{k^2} = \frac{\pi^2}{6}$$

### 2.2 New paragraphic equations

$$\lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{1}{k^2} = \frac{\pi^2}{6}$$

### 2.3 Cross-reference

$$\epsilon > 0 \tag{1}$$

From [\(1\)](#), ...

### 2.4 Texts in mathematical equations

Without texts:

$$\forall x \in \mathbf{R} : \quad x^2 \geq 0 \tag{2} \quad \text{To Contents}$$

With texts:

$$x^2 \geq 0 \quad \text{for all } x \in \mathbf{R} \tag{3}$$

### 2.5 Greeks

Lowers:  $\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, \omicron, \pi, \rho, \sigma, \tau, \upsilon, \phi, \chi, \psi, \omega$

Uppers:  $A, B, \Gamma, \Delta, E, Z, H, \Theta, I, K, \Lambda, M, N, \Xi, O, \Pi, P, \Sigma, T, \Upsilon, \Phi, X, \Psi, \Omega$

### 2.6 Roots

$$\sqrt[3]{x} \quad \sqrt[4]{x^2 + \sqrt[2]{y}} \quad \sqrt[3]{2}$$

### 2.7 Braces

$$\overline{x+y} \quad \underline{x+y} \quad \underbrace{x+y+\cdots+z}_{26} \quad \overbrace{x+y+\cdots+z}^{26}$$

## 2.8 Vectors

$$\vec{a} \quad \overrightarrow{AB}$$

## 2.9 Derivatives & Integrals & Summations & Products

Four processes.

Derivatives:

$$y = x^2 \quad y' = 2 \cdot x \quad y'' = 2 \quad \frac{\partial f(x)}{\partial x} = \frac{\partial g(x)}{\partial y}$$

Integrals:

$$\int_{-\infty}^{\infty} dx \, dy \quad \iiint_{-\infty}^{\infty} dx \, dy$$

summations:

$$\sum_{\substack{0 < x < n \\ 1 < y < m}} P(x, y) = \sum_{\substack{x \in I \\ 1 < y < m}} Q(x, y)$$

products:

$$\prod_{\epsilon}^{\infty}$$

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## 2.10 Functions

Example among many functions (cos, sin, exp, ...):

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

## 2.11 Fractions

$$\frac{x^2}{k+1} \quad x^{\frac{2}{k+1}} \quad x^{1/2}$$

## 2.12 Binomials

$$\binom{n}{k} \quad C_n^k$$

## 2.13 Brackets

Two ways of dealing with the brackets

Automatic sizings:

$$[a, b, c] \equiv [a, b, c] \left[ \frac{1}{1-x^2} \right]^3 \quad (a, b, c) \equiv (a, b, c) \left( \frac{1}{1-x^2} \right)^3 \quad a, b, c \neq \{a, b, c\} \left\{ \frac{1}{1-x^2} \right\}^3$$

Self sizings:

$$\left( (x+1) \cdot (x-1) \right)^2 \quad \left( \left( \left( \left( \right) \right) \right) \right) \left\{ \right\} \left\{ \right\}$$

## 2.14 Arrays

Three forms.

Full matrix form:

$$\mathbf{X} = \begin{pmatrix} x_{11} & x_{12} & \dots \\ x_{21} & x_{22} & \dots \\ \vdots & \vdots & \ddots \end{pmatrix}$$

Half matrix form:

$$y = \begin{cases} a & \text{if } good \\ b+c & \text{well...} \\ l & \text{good for you?} \end{cases}$$

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Separated form:

$$\left( \frac{1}{3} \middle| \frac{2}{4} \right)$$

## 2.15 Multilines

$$f(x) = \cos x \tag{4}$$

$$f'(x) = -\sin x \tag{5}$$

$$\int_0^x f(y)dy = \sin x \tag{6}$$

## 2.16 Advanced alignment with amsmath package

Total five environments.

Equation environment:

$$e^{\pi i} - 1 = 0 \tag{7}$$

Split environment:

$$\begin{aligned} A &= \frac{\pi r^2}{2} \\ &= \frac{1}{2}\pi r^2 \end{aligned} \tag{8}$$

Multiline environment:

$$\begin{aligned} p(x) &= 3x^6 + 19x^3y^3 \\ p(x) &= 3x^6 + 19x^3y^3 \\ p(x) &= 3x^6 + 19x^3y^3 \\ p(x) &= 3x^6 + 19x^3y^3 \end{aligned}$$

Gather environment:

$$\begin{aligned} 2x - 5y &= 8 \\ 3x^2 + 9y &= 1 \end{aligned}$$

Align environment:

$$\begin{aligned} x &= y & w &= z & a &= b + c \\ 2x &= -y & 3w &= \frac{1}{2}z & a &= b \\ -4 + 5x &= 2 + y & w + 2 &= -1 + w & ab &= cb \end{aligned}$$

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## 2.17 Delicate space control

$$\Gamma_{xy}^z \quad \text{vs} \quad \Gamma_{xy}^z$$

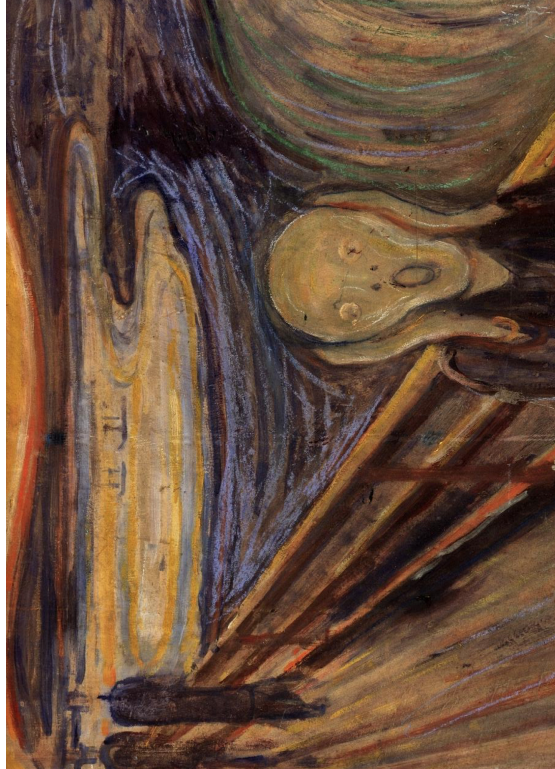
## 2.18 Bold in equations

$$\mu, M \quad \boldsymbol{\mu}, \boldsymbol{M}$$

## 2.19 Encapsulated PostScript, .eps



Figure 1: Upper caption



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Figure 2: Bottom caption

## 2.20 References

Kim [1] has proposed that ...

## References

- [1] Kim: *Korea*, Introduction to L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> (2016)

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