1 Symbols

$\forall x \in X, \quad \exists y \leq \epsilon$

2 Operators

$+ - = ! / ( ) [ ] <> | ' :$

$\cos(2\theta) = \cos^2\theta - \sin^2\theta$

$\lim_{x \to \infty} \exp(-x) = 0$

$a \bmod b$

$x \equiv a \pmod{b}$

3 Greek letters

$\alpha, A, \beta, B, \gamma, \Gamma, \pi, \Pi, \phi, \varphi, \Phi$

4 Powers and Indices

$k_{n+1} = n^2 + k_n^2 - k_{n-1}$

n^{22}

$f(n) = n^5 + 4n^2 + 2|_{n=17}$

5 Fractions

$\frac{n!}{k!(n-k)!} = \binom{n}{k}$

$\frac{\frac{1}{x}+\frac{1}{y}}{y-z}$

${}^3/_7$

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$$\frac{\begin{array}{r}(x_1 x_2) \\ \times (x_1' x_2')\end{array}}{(y_1 y_2 y_3 y_4)} \tag{1}$$

6 Roots

$\sqrt{\frac{a}{b}}$

$x = \sqrt{y^2 * 2}$

$\sqrt[n]{1 + x + x^2 + x^3 + \dots}$

7 Sums and Integrals

$\sum_{i=1}^{10} t_i$
$\int_0^\infty \mathrm{e}^{-x}\,\mathrm{d}x$

$$\sum\prod\coprod\bigoplus\bigotimes\bigodot\bigcup\bigcap\biguplus\bigsqcup\bigvee\bigwedge\int\oint\iint\iiint\iiiint\idotsint \tag{2}$$

$\sum_{\substack{0<i<m\\0<j<n}} P(i,j)$
$\int\limits_a^b$

8 Brackets, braces and delimiters

$(a), [b], \{c\}, |d|, \|e\|, \langle f\rangle, \lfloor g\rfloor, \lceil h\rceil, \ulcorner i\urcorner$
$\left(\frac{x^2}{y^3}\right)$
$P\left(A=2\middle|\frac{A^2}{B}>4\right)$
$\left\{\frac{x^2}{y^3}\right\}$
$\left.\frac{x^3}{3}\right|_0^1$
$(\big(\Big(\bigg(\Bigg($
$\frac{\mathrm{d}}{\mathrm{d}x}\left(kg(x)\right)$
$\frac{\mathrm{d}}{\mathrm{d}x}\big(kg(x)\big)$

9 Intervals

$x \in]-1,1[$
$x \in \left]-1,1\right[$
$x \in \mathopen]-1,1\mathclose[$

10 Matrices

$\begin{matrix} a & b & c \\ d & e & f \\ g & h & i \end{matrix}$
$\begin{matrix} -1 & 3 \\ 2 & -4 \end{matrix} = \begin{matrix} [r]-1 & 3 \\ 2 & -4 \end{matrix}$
$A_{m,n} = \begin{pmatrix} a_{1,1} & a_{1,2} & \cdots & a_{1,n} \\ a_{2,1} & a_{2,2} & \cdots & a_{2,n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m,1} & a_{m,2} & \cdots & a_{m,n} \end{pmatrix}$

$$M = \begin{bmatrix} \frac{5}{6} & \frac{1}{6} & 0 \\ \frac{5}{6} & 0 & \frac{1}{6} \\ 0 & \frac{5}{6} & \frac{1}{6} \end{bmatrix}$$

$$M = \begin{array}{cc} & \begin{array}{cc} x & y \end{array} \\ \begin{array}{c} A \\ B \end{array} & \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \end{array}$$

A matrix in text must be set smaller: $\left(\begin{smallmatrix} a & b \\ c & d \end{smallmatrix}\right)$ to not increase leading in a portion of text.

11 Text in equations

$50 apples \times 100 apples = lots of apples^2$

$50\text{apples} \times 100\text{apples} = \text{lots of apples}^2$

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$50 \text{ apples} \times 100 \textbf{ apples} = \textit{lots of apples}^2$

12 Accents

$a'a'\ a''a''\ \hat{a}\hat{a}\ \bar{a}\bar{a}\ \grave{a}\grave{a}\ \acute{a}\acute{a}\ \dot{a}\dot{a}\ \ddot{a}\ddot{a}\ \not{a}\ \not{a}\ \mathring{a}\overrightarrow{AB}\overrightarrow{AB}\ \overleftarrow{AB}\overleftarrow{AB}\ a'''a'''\ a''''a''''\ \overline{aaaaaa}\ \breve{a}\breve{a}\ \check{a}\check{a}\ \vec{a}\vec{a}\ \dddot{a}[3]\ddddot{a}[3]\widehat{AAA}\widehat{AAA}\ \widetilde{AAA}\widetilde{AA}$

13 Plusminus sign

$\pm$

$\mp$

14 Inline and Displayed Formulas

$x = \frac{1+y}{1+2z^2}$

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$\int_0^\infty e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$

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$\displaystyle\int_0^\infty e^{-x^2} dx$

$$\cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{3+x}}} + \frac{1}{1 + \frac{1}{2 + \frac{1}{3+x}}}$$

15 Spaces and Text in Formulas

$\sqrt{2}\sin x$, $\sqrt{2}\;\sin x$
$\iint f(x,y)\,\mathrm{d}x\mathrm{d}y$

$$\iint\limits_{\mathbf{x}\in\mathbf{R}^2} \langle \mathbf{x}, \mathbf{y} \rangle \, d\mathbf{x}$$

$$x_1 = a + b \text{ and } x_2 = a - b$$

$$x_1 = a + b \quad \text{and} \quad x_2 = a - b$$

$$\begin{aligned} y &= x^4 + 4 \\ &= (x^2+2)^2 - 4x^2 \\ &\leq (x^2+2)^2 \end{aligned} \tag{3}$$

$$\begin{aligned} e^x \quad &\approx \quad 1 + x + x^2/2! + \\ &\qquad + x^3/3! + x^4/4! + \\ &\qquad +x^5/5! \end{aligned}$$

$$\begin{aligned} &w + x + y + z = \\ &\qquad a + b + c + d + e + \\ &\qquad\; + f + g + h + i \end{aligned}$$

$$\begin{aligned} x \quad &= \quad \sin\alpha = \cos\beta \\ &= \quad \cos(\pi - \alpha) = \sin(\pi - \beta) \end{aligned}$$

$$\begin{aligned} x &= \sin\alpha = \cos\beta \\ &= \cos(\pi - \alpha) = \sin(\pi - \beta) \end{aligned}$$

$$\begin{aligned} x &= \sin\alpha & &= \cos\beta \\ &= \cos(\pi - \alpha) & &= \sin(\pi - \beta) \end{aligned}$$

16 Formula Numbering

$$x = y + 3 \tag{4}$$

In equation (7) we saw ...

...

$$x = y + 3 \tag{5}$$

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$$\begin{aligned} \int 1 &= x + C \\ \int x &= \frac{x^2}{2} + C \\ \int x^2 &= \frac{x^3}{3} + C \end{aligned} \tag{6}$$

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(7)

17 Braces

$]0,1[+ \lceil x \rfloor - \langle x, y \rangle$

$$\binom{n+1}{k} = \binom{n}{k} + \binom{n}{k-1}$$

$$|x| = \begin{cases} -x & \text{if } x < 0 \\ x & \text{otherwise} \end{cases}$$

$$F(x,y) = 0 \quad \text{and} \quad \begin{vmatrix} F''_{xx} & F''_{xy} & F'_x \\ F''_{yx} & F''_{yy} & F'_y \\ F'_x & F'_y & 0 \end{vmatrix} = 0$$

$$\underbrace{n(n-1)(n-2)\dots(n-m+1)}_{\text{total of } m \text{ factors}}$$

18 Accents

$\hat{x}$, $\check{x}$, $\tilde{a}$, $\bar{\ell}$, $\dot{y}$, $\ddot{y}$, $\vec{z_1}$, $\vec{z}_1$

$\hat{T} = \widehat{T}$, $\bar{T} = \overline{T}$, $\widetilde{xyz}$, $\overbrace{a + \underbrace{b + c} + d}$

$$\overline{\overline{a}^2 + \underline{xy} + \overline{\overline{z}}}$$

$$\underbrace{a + \overbrace{b + \cdots}^{=t} + z}_{\text{total}} \quad a + {\overbrace{b + \cdots}}^{126} + z$$