Notes Template

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Spring 2024

Contents

Chapter 1

Sample Chapter

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1.1 Sample Equations

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1.1.1 Greek Letters

$$\alpha, \beta, \gamma, \Gamma, \pi, \Pi, \phi, \varphi, \mu, \Phi, \xi, \zeta$$

$$\cos(2\theta\phi) = \cos^2\theta\phi - \sin^2\theta\phi \tag{1.1}$$

1.1.2 Delimiters

There are many types of delimiters one can use:

$$(a), [b], \{c\}, |d|, \|e\|, \langle f\rangle, \lfloor g\rfloor, \lceil h\rceil, \ulcorner i\urcorner$$

See how the delimiters are of reasonable size in these examples

$$\left(a+b\right)\left[1-\frac{b}{a+b}\right]=a\,, \tag{1.2}$$

$$\sqrt{|xy|}\leq\left|\frac{x+y}{2}\right|, \tag{1.3}$$

even when there is no matching delimiter

$$\int_a^b u\frac{d^2v}{dx^2}\,dx = \left.u\frac{dv}{dx}\right|_a^b - \int_a^b \frac{du}{dx}\frac{dv}{dx}\,dx. \tag{1.4}$$

whereas vector problems often lead to statements such as

$$u=\frac{-y}{x^2+y^2}\,,\quad v=\frac{x}{x^2+y^2}\,,\quad\text{and}\quad w=0\,. \tag{1.5}$$

1.1.3 Multiple Fractions

Typesetting continued fractions is easy:

$$x=a_0+\frac{1}{a_1+\frac{1}{a_2+\frac{1}{a_3+a_4}}} \tag{1.6}$$

However, as the fractions continue, they get smaller. If you want to keep the size consistent, use the display style; e.g.

$$x=a_0+\frac{1}{\displaystyle a_1+\frac{1}{\displaystyle a_2+\frac{1}{a_3+a_4}}} \tag{1.7}$$

1.1.4 Arrays

Arrays of mathematics are typeset using one of the matrix environments as in

$$\begin{bmatrix}1 & x & 0\\ 0 & 1 & -1\end{bmatrix}\begin{bmatrix}1\\ y\\ 1\end{bmatrix}=\begin{bmatrix}1+xy\\ y-1\end{bmatrix}. \tag{1.8}$$

$$\begin{pmatrix}2 & 3 & 4\\ 5 & 6 & 7\\ 8 & 9 & 10\end{pmatrix}v=0 \tag{1.9}$$

Case statements use cases:

$$|x| = \begin{cases} x, & \text{if } x \geq 0\,, \\ -x, & \text{if } x < 0\,. \end{cases} \tag{1.10}$$

Many arrays have lots of dots all over the place as in

$$\begin{matrix} -2 & 1 & 0 & 0 & \cdots & 0 \\ 1 & -2 & 1 & 0 & \cdots & 0 \\ 0 & 1 & -2 & 1 & \cdots & 0 \\ 0 & 0 & 1 & -2 & \ddots & \vdots \\ \vdots & \vdots & \vdots & \ddots & \ddots & 1 \\ 0 & 0 & 0 & \cdots & 1 & -2 \end{matrix} \tag{1.11}$$

1.1.5 Accents

Mathematical accents are performed by a short command with one argument, such as

$$\tilde{f}(\omega) = \frac{1}{2\pi} \int_{-\infty}^{\infty} f(x) e^{-i\omega x}\, dx\,, \tag{1.12}$$

or

$$\dot{\vec{\omega}} = \vec{r} \times \vec{I}\,. \tag{1.13}$$

1.1.6 Multiline equations and aligned environments

New lines do not work in equation environments. To achieve alignment of equations, use the aligned package to produce multiline aligned math, such as:

$$\begin{aligned} F = \{F_x \in F_c : {} & (|S| > |C|) \\ & \cap (\text{minPixels} < |S| < \text{maxPixels}) \\ & \cap (|S_{\text{conected}}| > |S| - \varepsilon)\} \end{aligned} \tag{1.14}$$

and also:

$$\begin{aligned} A_0 &= \frac{1}{(\alpha + t_x)^{r+s+x}}\, {}_2F_1 \left(r+s+x, x+1; r+s+x+1; \frac{\alpha - \beta}{\alpha + t_x} \right) \qquad (1.15) \\ &\quad - \frac{1}{(\alpha + T)^{r+s+x}}\, {}_2F_1 \left(r+s+x, x+1; r+s+x+1; \frac{\alpha - \beta}{\alpha + T} \right), \qquad (1.16) \end{aligned}$$

Theorem 1. For any nonnegative integer n, we have $(1+x)^n = \sum_{i=0}^{n} \binom{n}{i} x^i$

Appendices

Appendix A

My Appendix

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A.1 My figures

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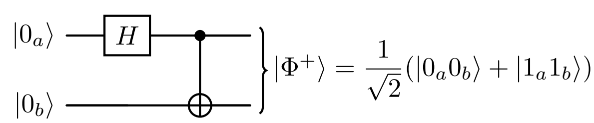

Figure A.1: Example of Tikz figure [1].

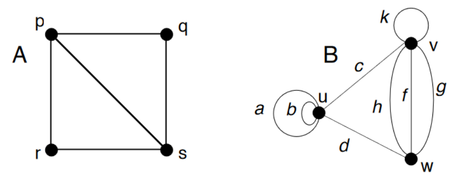

Figure A.2: Example of figure.

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Bibliography

[1] M. A. Nielsen and I. L. Chuang, *Quantum Computation and Quantum Information: 10th Anniversary Edition.* Cambridge University Press, 2011.