Notes Template

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Contents

Abstract

This is a template for taking lecture notes in mathematics/physics. Feel free to adapt it or to make suggestions. I must thank Pingbang Hu, who made the original template which I have adapted [Hu23].

1 Introduction

1.1 A subsection

Let's showcase some of the environments.

Definition 1.1 (Template) A document or file having a preset format, used as a starting point for a particular application so that the format does not have to be recreated each time it is used.

Definition This definition is not numbered and does not have a title.

We can also reference such environments in our template.

Theorems can be proved in the same box,

Theorem 1.1

$$1 + 1 = 2$$

Proof Trivial ■

or in a seperate box, as seen in appendix A.1.

There are similar environments for the following:

- propositions
- conjectures
- corollaries
- lemmas

Exercises and answers behave like theorems and proofs.

Exercise 1.1 Show that

$$\int_0^{2\pi} dx = 2\pi$$

Answer

$$\begin{aligned}\int_0^{2\pi} dx &= \Big[x\Big]_0^{2\pi} \\ &= 2\pi - 0 \\ &= 2\pi\end{aligned}$$

⊛

Example Calculate $\partial_v f(x, y)$ for the function $f(x, y) = x^2 - y^2$ in the direction of $v = (a, b)$.

Solution

$$\begin{aligned}f\left((x, y) + t(a, b)\right) = (x + ta)^2 - (y + tb)^2 = x^2 + 2tax + t^2a^2 + y^2 - 2tby - t^2b^2 \\ \therefore \frac{d}{dt} f(x + tv) = 2ax + 2ta^2 - 2by - 2tb^2, \\ \partial_v f(x, y) = \frac{d}{dt} f(x + tv)\Big|_{t=0} = 2ax - 2by.\end{aligned}$$

⊛

Note Environments can be nested.

Notation For $1 \leq i \leq n$, $\partial_{v_i} f(x)$ is called the *i^{th}-partial derivative* of $f : U \to \mathbb{R}^k$ at $x \in U$.

2 Other environments

2.1 Algorithms

The following example is taken from the `algorithm2e` package documentation.

Algorithm 2.1 (Example)

Data: this text
Result: how to write algorithm with LaTeX2e
initialization;
while *not at end of this document* **do**
    read current;
    if *understand* **then**
        go to next section;
        current section becomes this one;
    else
        go back to the beginning of current section;

2.2 Formulas

Useful for physics notes.

Gibb's entropy

$$S := -k_{\mathrm{B}} \sum_i P_i \ln P_i \tag{2.1}$$

Appendices

A Additional Proofs

A.1 Proof of Theorem 1.1

We can now prove theorem 1.1.

Proof of theorem 1.1 See the Principia Mathematica. ■

References

[Hu23] Pingbang Hu. *Note Template*. Last accessed 14 September 2023. 2023. URL: https://github.com/sleepymalc/LaTeX-Template/tree/main/Note.