# Note Template

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**Abstract**

This is a note template, with all but minimal compilable files provided. Feel free to adjust for your usage.

Now let's start a simple demo for you to take fancy notes in LaTeX!

# Contents

# Chapter 1

# Introduction

### Lecture 1: First Lecture

13 Oct. 08:00

## 1.1 Useful Environment

We now see some common environment you'll need to complete your note.

**Definition 1.1.1** (Natural number)**.** We denote the set of *natural numbers* as $\mathbb{N}$.

**Lemma 1.1.1** (Useful lemma)**.** Given the axioms of natural numbers $\mathbb{N}$, we have

$$0 \neq 1.$$

**An obvious proof.** Obvious. ■

**Proposition 1.1.1** (Useful proposition)**.** From Lemma 1.1.1, we have

$$0 < 1.$$

**Exercise.** Prove that $1 < 2$.

**Answer.** We note the following.

> **Note.** We have Proposition 1.1.1! We can use it iteratively!

With the help of Lemma 1.1.1, this holds trivially. ■

**Example.** We now can have $a < b$ for $a < b$!

**Proof.** Iteratively apply the exercise we did above. ■

**Remark.** We see that Proposition 1.1.1 is really powerful. We now give an immediate application of it.

**Theorem 1.1.1** (Mass-energy equivalence)**.** Given Proposition 1.1.1, we then have

$$E = mc^2.$$

**Proof.** The blank left for me is too small,[a] hence we put the proof in Appendix A.1. ■

[a] https://en.wikipedia.org/wiki/Richard_Feynman

**Corollary 1.1.1** (Riemann hypothesis). From Theorem 1.1.1, we then have the following.

The real part of every nontrivial zero of the Riemann zeta function is $\frac{1}{2}$, where the Riemann zeta function is just

$$\zeta(s) = \sum_{n=1}^{\infty} \frac{1}{n^s} = \frac{1}{1^s} + \frac{1}{2^s} + \frac{1}{3^s} + \cdots .$$

**Proof.** The proof should be trivial, we left it to you. ■

DIY

**As previously seen.** We see that Lemma 1.1.1 is really helpful in the proof!

**Internal Link**

You should see all the common usages of internal links. Additionally, we can use citations as [New26], which just link to the reference page!

## 1.2 Figures

A simple demo for drawing:

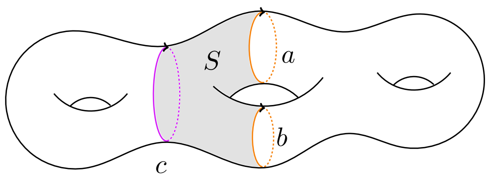


Figure 1.1: A 3-torus.[1]

## 1.3 Commutative Diagram

We can use the package `tikz-cd` to draw some commutative diagram.

**Example.** The cellular homology agrees with singular homology.

**Proof.** The following commutative diagram shows everything.

$$\begin{tikzcd}
 & & & & 0 & & \\
 & 0 \arrow[dr] & & H_n(X^{n+1}) \cong H_n(X) \arrow[ur] & & & \\
 & & H_n(X^n) \arrow[ur] \arrow[dr, "j_n"] & & & & \\
\cdots \arrow[r] & H_{n+1}(X^{n+1}, X^n) \arrow[ur, "\partial_{n+1}"] \arrow[rr, "d_{n+1}"] & & H_n(X^n, X^{n-1}) \arrow[rr, "d_n"] \arrow[dr, "\partial_n"] & & H_{n-1}(X^{n-1}, X^{n-2}) \arrow[r] & \cdots \\
 & & & & H_{n-1}(X^{n-1}) \arrow[ur, "j_{n-1}"] & & \\
 & & & 0 \arrow[ur] & & &
\end{tikzcd}$$

■

[1] For detailed information, please see `https://github.com/sleepymalc/VSCode-LaTeX-Inkscape`.

# Appendix

# Appendix A

# Additional Proofs

## A.1 Proof of Theorem 1.1.1

We can now prove Theorem 1.1.1.

**Proof of Theorem 1.1.1.** See https://en.wikipedia.org/wiki/Mass%E2%80%93energy_equivalence. ∎

# Bibliography

[New26] I. Newton. *Philosophiae naturalis principia mathematica*. Innys, 1726. URL: https://books.google.com/books?id=WeZO9rjv-1kC.