

Exercise 1: Trivial Exercise

This is an example document.

Question 1

$1 + 1 \stackrel{?}{=} 3.$

?

Hint. Consider $1 + 1 = 2$.



Claim 1

Yes.



Proof of Claim 1. This is a good question.

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Proof by Triviality. Trivial.

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Remark 1. This is very trivial.



Theorem 1 – HelloWorld

This is NOT a theorem.

Definition 1 – Byebye

This is DEFINITELY a theorem.

Chapter 1: Non-Trivial Chapter

Recall that we have already explained in lecture that all rational function of a single variable can be integrated in finite terms. Starting from there, we introduce integrals of the form, known as the **binomial integrals**:

$$(1) \quad J_{p,q} = \int (a + bz)^p z^q dz, a, b \in \mathbb{R}, p, q \in \mathbb{Q}.$$

This exercise aims at studying the rationalization of the binomial integral, as well as some of its applications.

Question 1

Assume that $p \in \mathbb{Z}$, rationalise the integrand. ?

Since $q \in \mathbb{Q}$, this implies there exists $m \in \mathbb{Z}, n \in \mathbb{N}$ such that $q = \frac{m}{n}$. Then, $J_{p,q}$ can be written as

$$J_{p,q} = \int (a + bz)^p z^{\frac{m}{n}} dz.$$

Let $z = x^n$, then $dz = n \cdot x^{n-1} dx$. Replace z with x we have

$$J_{p,q} = \int (a + b \cdot x^n)^p \cdot (x^n)^{\frac{m}{n}} \cdot n \cdot x^{n-1} dx.$$

Simplify it and we get

$$J_{p,q} = n \int (a + b \cdot x^n)^p \cdot x^{m+n-1} dx.$$

Now, by binomial theorem we can see the integrand is rationalised, as needed. ☺

Lemma 1

This is a lemma.

This is a math environment. ☺

Corollary 1

This is a corollary.

Exercise 2**Question 1**

We can see the question counter is auto reset to 1 when we start a new exercise / chapter / unit. ?

Proof. Proof by alittlebear.cls code, left as an exercise to the reader :)

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