Short Notes Test Document

Your Name

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1 Introduction

This document tests all the custom features of the **Short Notes** template.

1.1 Cross-referencing

We define a special vector below:

Definition 1.1 (Vectors of Zeros and Ones)**.** A vector of zeros, denoted **0**, is a vector where all components are zero. Similarly, a vector of ones, denoted **1**, is a vector where all components are one.

As we saw in Definition 1.1 these special vectors have important properties.

1.2 Theorems and Proofs

Theorem 1.1 (Vector Addition)**.** Let **0** be the zero vector. Then, for any vector **v**:

$$\mathbf{0} + \mathbf{v} = \mathbf{v}.$$

1.2.1 Proof

Proof:

By the definition of \(\mathbf{0}\), adding it to any vector does not change the vector:

$$\mathbf{0} + \mathbf{v} = \mathbf{v}.$$

□

□

As shown in Theorem 1.1 the zero vector behaves as expected.

1.3 Example Applications

Example 1.2 (Vector Computation Example)**.** Consider the vector $\mathbf{v} = (3, 4)$. Then,

$$\mathbf{0} + \mathbf{v} = (3, 4).$$

1.4 Important Notes and Warnings

🌟 **Important**

Key Concept
Understanding the role of the zero vector is fundamental in linear algebra.

⚠️ **Warning**

Common Mistakes
Be careful to distinguish between scalar zero 0 and the zero vector **0**.

1.5 Code Examples

We can compute with vectors in R:

```
v <- c(3, 4)
z <- c(0, 0)
v + z  # Should return (3,4)
```

```
## [1] 3 4
```

Inline calculation: The result of $2+2$ is 4.

1.6 Conclusion

This document successfully tests:

- Theorem-like environments
- Cross-referencing
- Custom boxes (warnings, examples, important notes)
- Code execution
- Mathematical notation