# A Comprehensive LaTeX Document Example

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# 1 Introduction

This is an introduction to LaTeX features. LaTeX is great for writing technical and scientific documents.

# 2 Mathematical Equations

Here is an inline equation: $E = mc^2$.

A displayed equation:

$$\int_a^b f(x)\,\mathrm{d}x = F(b) - F(a) \tag{1}$$

A matrix:

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \tag{2}$$

# 3 Tables and Figures

A simple table:

| A | B | C |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |

Table 1: A sample table

An example figure:

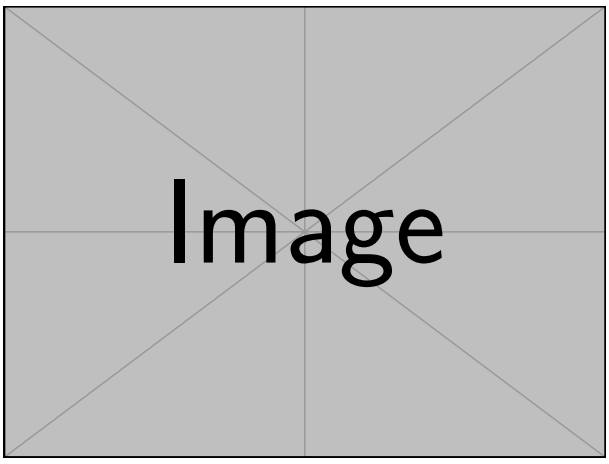



Figure 1: An example image

# 4 Code Listings

Here is some example code:

Listing 1: Example Python Code

```
def hello():
    print("Hello, World!")
```

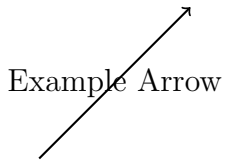
# 5 Algorithms

An example algorithm:

**Algorithm 1** Example Algorithm

Initialize $x = 0$
**for** $i = 1$ to $n$ **do**
  $x = x + i$
**end for**
Return $x$

# 6 Diagrams with TikZ




# 7 Notations

**Notations:** Some common mathematical notations include:

- **Sets:** $\mathbb{N}$ (natural numbers), $\mathbb{Z}$ (integers), $\mathbb{R}$ (real numbers)
- **Operators:** $\sum_{i=1}^{n} i$, $\prod_{i=1}^{n} i$, $\lim_{x \to \infty} f(x)$
- **Logic:** $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}$

# 8 Citations and References

We cite an example source [1].

# References

[1] John Doe and Jane Smith. "An Example Research Paper". In: *Journal of Examples* 10.2 (2020), pp. 100–110. DOI: 10.1234/example.