Writing Equations in LaTeX

This document showcases various ways to write mathematical equations in LaTeX, along with how to cite and reference them.

1. Inline Equations

Inline equations appear within text, such as $a^2 + b^2 = c^2$, or the famous identity $e^{i\pi} + 1 = 0$.

2. Displayed Equations

Equations can be displayed on a separate line for clarity:

$$\int_0^1 x^2 \, dx = \frac{1}{3}$$

$$E = mc^2 \tag{1}$$

3. Aligning Multiple Equations

When showing multiple steps or related expressions, aligned equations work best:

$$x + y = 10 \tag{2}$$
$$x - y = 4 \tag{3}$$

4. Centered Equations Without Alignment

For unrelated equations:

$$a + b = c \tag{4}$$
$$m^2 - n^2 = (m + n)(m - n) \tag{5}$$

5. Long Equations (Multline)

Long equations that don't fit in one line can be written as:

$$f(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \cdots + a_n x^n +$$

$$+ a_{n+1} x^{n+1} + \cdots + a_{2n} x^{2n} \quad (6)$$

6. Piecewise Functions

Define functions based on conditions:

$$f(x) = \begin{cases} x^2 & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases} \quad (7)$$

7. Using `eqnarray`

Although somewhat outdated, `eqnarray` can still be used:

$$a = b + c \quad (8)$$
$$= d - e \quad (9)$$

8. Referencing and Bibliography

Equation 10 below expresses Newton's second law of motion:

$$F = ma \quad (10)$$

The Pythagorean theorem, $a^2 + b^2 = c^2$, remains central in Euclidean geometry. This and other essential mathematical results are well discussed in *The LaTeX Companion* [1].

References

[1] Michel Goossens, Frank Mittelbach, and Alexander Samarin,
    The LaTeX Companion, Addison-Wesley, 1993.