

# The 20 Most Important Mathematical Equations

A journey through the most elegant and influential formulas in mathematics

## 1. Euler's Identity

$$e^{i\pi} + 1 = 0$$

Connects five fundamental constants (e, i, π, 1, 0), revealing the profound relationship between exponential functions and trigonometry.

## 2. Pythagorean Theorem

$$a^2 + b^2 = c^2$$

In right triangles, the hypotenuse squared equals the sum of the squares of the other sides. Cornerstone of geometry with applications in navigation and architecture.

## 3. The Fundamental Theorem of Calculus

$$\int_a^b f(x) dx = F(b) - F(a)$$

Establishes that differentiation and integration are inverse operations. If F is an antiderivative of f, the definite integral equals F(b) - F(a). Revolutionized mathematical problem-solving.

## 4. Maxwell's Equations

$$\nabla \cdot \mathbf{E} = \frac{Q}{\epsilon_0}$$

$$\nabla \cdot \mathbf{B} = 0$$

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$

$$\nabla \times \mathbf{B} = \mu_0 \mathbf{J} + \mu_0 \epsilon_0 \frac{\partial \mathbf{E}}{\partial t}$$

Unified electricity and magnetism as manifestations of the same force. Describes electromagnetic field behavior, predicting waves traveling at light speed. Enabled technologies from radio to smartphones.

