



Mathematics for Every Teacher

with Jake Tawney

Lecture 10: Euler's Identity

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

Outline:

Euler's Identity, Five Important Numbers

- 0
- 1
- π
- e

$$e = 1 + \frac{1}{1} + \frac{1}{2 \times 1} + \frac{1}{3 \times 2 \times 1} + \frac{1}{4 \times 3 \times 2 \times 1} + \frac{1}{5 \times 4 \times 3 \times 2 \times 1} + \dots$$

$$e = \frac{1}{0!} + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots$$

- Definition: The number e is the amount of money in an account after one year if the account started with \$1.00 and earned 100% interest that is compounded every moment, i.e. "continuously."
- Alternate Definition: The number e is the value of $(1 + \frac{1}{n})^n$ as n gets bigger and bigger.
- i
- Definition: If a number solves a polynomial equation using only integers, it is an *algebraic number*. A number that is not algebraic is called a *transcendental number* (π and e are two transcendental numbers).
- Euler's Identity: $e^{\pi i} + 1 = 0$

