

Math Diversion 538

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Complex numbers play a crucial role in various fields:
Solving Algebraic Equations, Fourier Analysis, Complex
Functions, Fractals, Fast Fourier Transform, Quantum
Mechanics, Electromagnetic Theory, Relativity,
Signal Processing, Control Systems,
Electrical Engineering.
— Copilot (a shortened listing)

The YouTube video is found at:

Source: <https://www.youtube.com/watch?v=KnayG-Zi1Y0>
Title: Solving a Nice Olympiad Mathematics Exponential Equation
Presenter: New Track Mathematics Video

1 The Problem

Given the relation

$$(1 + i)^x = 16, \quad (1)$$

find all values of x .

2 The Solution

Eq. (1) can first be rewritten as

$$(\sqrt{2}e^{i\pi/4})^x = 16 = 2^4. \quad (2)$$

By squaring both sides, we get

$$(2e^{i\pi/2})^x = 2^8. \quad (3)$$

By inspection, we get

$$x = 8, \quad (4)$$

since

$$(e^{i\pi/2})^8 = e^{4i\pi} = 1. \quad (5)$$