

Math Diversion Problem 367

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Chance favors the prepared mind.
— Louis Pasteur

The YouTube video is found at:

Source: <https://www.youtube.com/watch?v=BDK-ac6mAT8>
Title: A Nice Type of Exponential Equation
Presenter: SyberMath

1 The Problem

Given the relation

$$x^{3x^{15}} = 5, \tag{1}$$

find the values of x .

2 The Solution

In problems like these, I like to make a standard variable change, such as:

$$x = 5^\alpha. \tag{2}$$

Then (1) becomes,

$$(5^\alpha)^{3(5^\alpha)^{15}} = 5^1, \tag{3}$$

or, on equating the exponents,

$$3\alpha 5^{15\alpha} = 1. \tag{4}$$

Trying some simple values of α , I come up with $\alpha = 1/15$. Hence,

$$x = 5^{1/15}. \tag{5}$$