Math Diversion Problem 409

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> He that answereth a matter before he heareth it,
> it is folly and shame unto him.
> — Proverbs 18:13

The YouTube video is found at:

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Source: https://www.youtube.com/watch?v=wQrM5usqXAQ
Title: A Nice Math Olympiad Exponential Equation X^x^3 = 36
 Presenter: MrMath
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1 The Problem

Given the relation

$$x^{x^3} = 36 = 6^2\,, \tag{1}$$

find the values of x.

2 The Solution

My preferred way to proceed in this type of problem is to make a change in variable:

$$x = 6^\alpha\,, \tag{2}$$

Substituting this into (1), we get

$$(6^\alpha)^{(6^\alpha)^3} = 6^2\,, \tag{3}$$

from which we get

$$\alpha 6^{3\alpha} = 2\,. \tag{4}$$

The obvious solution for α is $1/3$, making the solution for x:

$$x = 6^{1/3}\,. \tag{5}$$