

Math Diversion Problem 457

P. Reany

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I love it when a plan comes together.
— Hannibal Smith, *The A-Team*

The YouTube video is found at:

Source: <https://www.youtube.com/watch?v=JsxpF95w8YQ>
Title: Harvard University Admission Interview Tricks
Presenter: Super Academy

1 The Problem

Given the relation

$$x^{x^{x^4}} = 4, \tag{1}$$

find the values of x .

2 The Solution

Let's try an α substitution to (1). Let

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

then (1) becomes

$$(2^\alpha)^{(2^\alpha)^{(2^\alpha)^4}} = 2^2. \tag{3}$$

Equating exponents this becomes

$$\alpha 2^{\alpha 2^{4\alpha}} = 2. \tag{4}$$

Now, $\alpha = \frac{1}{2}$ works in (4). Thus,

$$x = \sqrt{2}. \tag{5}$$