Math Diversion Problem 760

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> When I give this talk to a physics audience, I
> remove the quotes from my 'Theorem'.
> — Brian Greene

The material here is found at:

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Source: https://www.youtube.com/watch?v=ArPQNEX9M3Y
Title: Can you solve?
 Presenter: Leo Dorber
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1 The Problem

Given the relation

$$x^{x^7} = 196\,, \tag{1}$$

find the real values of x.

2 The Solution

Note that $196 = 14^2$. Let

$$x = 14^{\alpha}\,, \tag{2}$$

then, (1) becomes

$$14^{\alpha 14^{7\alpha}} = 14^2\,. \tag{3}$$

On setting the exponents equal, we have that

$$\alpha 14^{7\alpha} = 2\,. \tag{4}$$

By inspection, we get

$$\alpha = \frac{1}{7}\,, \tag{5}$$

for α's real value. Hence,

$$x = 14^{1/7}\,. \tag{6}$$