

# Math Diversion 962

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Physics intuition completely justifies such a  
transgression against rigor.  
— Ettore Majorana

Source: [https://www.youtube.com/watch?v=y\\_LGJI8vBYs](https://www.youtube.com/watch?v=y_LGJI8vBYs)  
Title: A Challenging Exponential Problem  
Presenter: Click Academics

## 1 Problem

Given the relation

$$x^{x^5} = 100, \tag{1}$$

find the real value for  $x$ .

## 2 Solution

Let

$$x = 10^\alpha, \tag{2}$$

then (1) becomes

$$10^{\alpha 10^{5\alpha}} = 10^2. \tag{3}$$

On equating exponents, we have that

$$\alpha 10^{5\alpha} = 2. \tag{4}$$

Multiplying through by 5, we get

$$5\alpha 10^{5\alpha} = 10. \tag{5}$$

At this point, we could employ the Lambert W function, but not this time. This time we will finish the problem by finding  $\alpha$  by inspection, which gives us

$$\alpha = 1/5 \implies x = 10^{1/5}. \tag{6}$$