

# Math Diversion Problem 318

P. Reany

January 27, 2025

Lifelong learning is no longer a luxury but  
a necessity for employment.  
— Jay Samit

The YouTube video is found at:

Source: <https://www.youtube.com/watch?v=aYeuiX9nGG0>  
Title: Can you pass College Entrance Aptitude Test ?  
Presenter: Super Academy

## 1 The Problem

Given the relation

$$x^{\log_3 x} = 81, \quad (1)$$

find the real values of  $x$ .

## 2 The Solution

Let's take the logarithm base 3 across the Given relation, to get

$$(\log_3 x)^2 = \log_3 81 = \log_3 3^4 = 4. \quad (2)$$

On taking the square root,

$$\log_3 x = \pm 2. \quad (3)$$

Then use the relation (3) to exponentiate 3:

$$3^{\log_3 x} = 3^{\pm 2}. \quad (4)$$

Finally,

$$x = 9, 1/9. \quad (5)$$