Math Diversion 721

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The problem is found at:

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Source: https://www.youtube.com/watch?v=q1sSAu7TvEY
Title: Stanford University Admission Interview Tricks
 Presenter: Super Academy
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1 Problem

Given the relation

$$10^{x+1} - 10^{x-1} = 100\,, \tag{1}$$

solve for x over the complex numbers

2 Solution

The Given can be rewritten as

$$10^x(10 - \frac{1}{10}) = 100\,. \tag{2}$$

Now, clear fractions:

$$10^x(100 - 1) = 1000\,, \tag{3}$$

or

$$10^x = \frac{1000}{99}\,. \tag{4}$$

For good measure, throw in a factor of $e^{2\pi in}$:

$$10^x = \frac{1000}{99}e^{2\pi in}, \quad n \in \mathbb{Z}\,. \tag{5}$$

Next, take the natural logarithm, to get

$$x \ln 10 = \ln\,(1000/99 + 2\pi in), \quad n \in \mathbb{Z}\,. \tag{6}$$

Solve for x:

$$x = \frac{\ln\,(1000/99) + 2\pi in}{\ln 10}, \quad n \in \mathbb{Z}\,, \tag{7}$$

and this is the WolframAlpha answer.