

# Math Diversion Problem 830

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America means: democracy, equal protection under the law,  
the importance of every human being, personal integrity  
and truthfulness, giving up undue feelings of entitlement,  
literacy and a robust secular education for all,  
and providing for the general welfare.  
— The Author

Source: [https://www.youtube.com/watch?v=psS7fG\\_kFd8](https://www.youtube.com/watch?v=psS7fG_kFd8)  
Title: An Imaginary Exponential Equation | Problem 346  
Presenter: aplusbi

## 1 Problem

Given the relation

$$i^{z+i} = 1, \tag{1}$$

solve for  $z$ .

## 2 Solution

We begin by rewriting (1) to

$$(e^{\pi i/2})^{z+i} = e^{2\pi i n} \quad \text{where } n \in \mathbb{Z}. \tag{2}$$

Next, we take the natural logarithm:

$$(z+i)\pi i/2 = 2\pi i n \quad \text{where } n \in \mathbb{Z}. \tag{3}$$

After a little algebra, we have that

$$z = 4n - i \quad \text{where } n \in \mathbb{Z}. \tag{4}$$