Math Diversion 526

P. Reany

April 22, 2025

> Average talent, plus hard work and dedication,
> will always beat talent by itself.
> — Clinton Anderson

The YouTube video is found at:

```
Source: https://www.youtube.com/watch?v=MFxh4JSy0fg
Title: A Nice Cubic Equation | Problem 525
 Presenter: aplusbi
```

1 The Problem

Given the relation

$$z^3 + (2-i)z^2 = 2iz\,, \tag{1}$$

find the values of z.

2 The Solution

We can simplify (1) down to,

$$z[z^2 + (2-i)z^2 - 2i] = 0\,. \tag{2}$$

We can declare the first solution as $z = 0$, and then continue:

$$z^2 + (2-i)z^2 - 2i = 0\,. \tag{3}$$

Using the quadratic formula, I get for z:

$$z = \frac{(i-2) \pm \sqrt{3+4i}}{2}\,. \tag{4}$$

WolframAlpha calculated $\sqrt{3+4i}$ for me:

$$\sqrt{3+4i} = 2 + i\,. \tag{5}$$

Using this value in (4), we end up with the additional two solutions:

$$z = -2, i\,. \tag{6}$$