Math Diversion 1028

P. Reany

January 30, 2026

> Our greatest weakness lies in giving up. The most certain way to succeed is always to try just one more time.
> —Thomas Edison

```
Source: https://www.youtube.com/watch?v=vGUfwLCHc4w
Title: Maths Olympiad Problem
 Presenter: Spencer's Academy
```

1 Problem

Given the relation

$$(x + 500)^3 = 20 - x\,, \tag{1}$$

solve for x.

2 Solution

My instinct is to simplify the thing being cubed. So, let's let

$$y \equiv x + 500\,. \tag{2}$$

Then (1) becomes (with some algebra)

$$y^3 + y - 520 = 0\,. \tag{3}$$

I used calculus to see if this polynomial has any real critical points. It doesn't. So this is a monotonic function with exactly one real root.

At this point, I would normally use WolframAlpha to finish, but if I assume an integer root, I might be able to finish the problem using a table.

y	y^3	$y-520$	$+$
6	216	-514	$\neq 0$
7	343	-513	$\neq 0$
8	512	-512	$= 0$

The rightmost column is the sum of the previous two columns. (There are a few equally workable ways to set up the columns.)

Great, so now that we know y, what is x?

$$x = y - 500 = -492\,. \tag{4}$$

So, how does one know where to begin with y values in the table? My method is to look at what my intuition thinks are extreme values that "obviously" don't work and then try some intermediate values.