Solving equations by graphing:

Solve this equation: $x^3 + x^2 - 5x + 1 = -2x - 3$

Method 1:
Finding Intersections

Graph the two sides of the equation as separate graphs Y_1 and Y_2.

$Y_1 = x^3 + x^2 - 5x + 1$

$Y_2 = -2x - 3$

Method 2:
Finding Zeros

Move everything to one side of the equation so the other side = 0

$x^3 + x^2 - 3x + 4 = 0$

You only get one answer from the graph:

$x = -2.68$

A polynomial of degree n has exactly n solutions.

Some of these solutions may by imaginary!

Only real solutions show up on a graph.

Find all 3 solutions to this polynomial:

$$x^3 + 3x^2 - 4x - 11 = 0$$

From the graph:

$$\boxed{x = -3.17,\ -1.78,\ 1.95}$$

Find all 3 solutions to this polynomial:

$$x^3 - 2x^2 + 7x - 14 = 0$$

$$(x-2)(x^2+7)$$

$$x^2 + 7 = 0$$

$$\sqrt{x^2} = \sqrt{-7}$$

$$\boxed{x = \pm i\sqrt{7},\ 2}$$

	x	-2
x^2	x^3	$-2x^2$
$+7$	$+7x$	-14

Difference of Perfect Squares:

$49x^2 - 100 = (7x + 10)(7x - 10)$

$(a^2 - b^2) = (a + b)(a - b)$

Sum of Perfect Squares:

$x^2 + 36$ This doesn't factor!

$a^2 + b^2$ never factors!

36

0

No two numbers multiply to 36 and add to 0.

$x^3 - 8$

this isn't the difference of Perfect Squares but it is the Difference of Perfect Cubes.

Difference of Perfect Cubes:

$$\boxed{a^3 - b^3 = (a - b)(a^2 + ab + b^2)}$$

$x^3 - 8 = (x-2)(x^2+2x+4)$

$a = x$

$b = 2$

Perfect Cubes:

$1^3 = 1$

$2^3 = 8$

$3^3 = 27$

$4^3 = 64$

$5^3 = 125$

Unlike the Sum of Perfect Squares, the Sum of Perfect Cubes does factor:

$x^3 + 27 =$

Sum of Perfect Cubes:

$$\boxed{a^3 + b^3 = (a + b)(a^2 - ab + b^2)}$$

$x^3 + 27 = (x+3)(x^2-3x+9)$

$a = x$

$b = 3$