Lesson 13 (Pt 2)

Example 5: Solve $1x^4 + 2x^3 - 4x^2 - 10x - 5 = 0$. ($a_n$, a_0)

Rational Zero Thm stated that a potential zero for a function is $\frac{p}{q}$ where p is a factor of the constant term a_0
q is a factor of the leading term a_n

$$f(x) = a_n x^n + \ldots + a_0$$

$a_n = 1$ factors are ± 1
$a_0 = -5$ factors are $\pm 1, \pm 5$

Possible zeroes, $\frac{(\pm 1, \pm 5)}{(\pm 1)} = \pm 1, \pm 5$

$f(x) = x^4 + 2x^3 - 4x^2 - 10x - 5$
$f(1) = 1 + 2 - 4 - 10 - 5 \neq 0$
$f(-1) = 1 - 2 - 4 + 10 - 5 = 0 \Rightarrow x = -1$ is a zero.

Synthetic division by -1:

	x^4	x^3	x^2	x	c
	1	2	−4	−10	−5
		+ −1	+ −1	+ 5	+ 5
−1	1	1	−5	−5	0

Synthetic division by -1 again:

	1	1	−5	−5
		+ −1	+ 0	+ 5
−1	1	0	−5	0

$f(x) = (x+1)(x^3 + x^2 - 5x - 5)$ — Finish it off w/ grouping

$= (x+1)[x^2(x+1) - 5(x+1)]$
$= (x+1)(x+1)(x^2 - 5) = 0$
$x = -1, \quad x = -1, \quad x^2 = 5, \quad x = \pm\sqrt{5}$

Solutions: $-\sqrt{5}, -1, \sqrt{5}$

$x = \pm\sqrt{5}$

Solutions: $-\sqrt{5}, -1, \sqrt{5}$