2-3 Day 2

I. Find all the zeros of the function.

Ex 1) $f(x) = 10x^3 - 15x^2 - 16x + 12$ (Q, P)

P: $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

Q: $\pm 1, \pm 2, \pm 5, \pm 10$

P/Q: $\pm 1, \pm \frac{1}{2}, \pm \frac{1}{5}, \pm \frac{1}{10}, \pm 2, \pm \frac{3}{2}, \pm 3, \pm \frac{3}{5}, \pm \frac{3}{10}, \pm 4, \pm \frac{4}{5}, \pm 6, \pm \frac{6}{5}, \pm 12, \pm \frac{12}{5}$

45, −16, 29, 8, 2

	10	−15	−16	12
1	10	−5	−21	−9
3	10	15	29	99
2	10	5	−6	0

$10x^2 + 5x - 6 = 0$

$a = 10$, $b = 5$, $c = -6$

$x = 2$

$x = \frac{-5 \pm \sqrt{5^2 - 4(10)(-6)}}{2(10)}$ (25 − −240)

$x = \frac{-5 \pm \sqrt{265}}{20}$

II. **Decartes Rule:** helps ID the possible number of real zeros. See page 120.

Ex 2) $f(x) = 3x^3 - 5x^2 + 6x - 4$ (f(x))

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Yes Yes Yes

$f(-x) = 3(-x)^3 - 5(-x)^2 + 6(-x) - 4$

$= -3x^3 - 5x^2 - 6x - 4$

Pos.: 3 or 1 pos. zeros

Neg.: none

III. Upperbound and Lowerbound Rules: Page 121 (use synthetic division)

1. If $x > 0$ and each number in the last row is positive or zero, then x is an upperbound.
2. If $x < 0$ and each number in the last row alternate positive and negative signs, x is a lower bound.

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

Verify that the upper bound is $x = 3$ and that the lower bound is $x = -4$

x	2	0	0	−8	3
3	2	6	18	46	141
−4	2	−8	32	−136	547

−128

544

all positives

alt. signs