Bellwork:

How many zeros are there in the polynomial:

$$f(x) = x^3 + 5x^2 + 4x + 20 = 0$$

Chapter 5.7: Apply the Fundamental Theorem of Algebra

The highest exponent in the polynomial tells you how many solutions/zeros/roots/factors there are.

Find all zeros: $-1, -1, 2, 2\pm\sqrt{3}i$

$$f(x) = x^5 - 4x^4 + 4x^3 + 10x^2 - 13x - 14$$

$\frac{p}{q} = \frac{14}{1} = \frac{1,2,7,14}{1} = \pm1, \pm2, \pm7, \pm14$

-1	1	-4	4	10	-13	-14
		-1	5	-9	-1	14
-1	1	-5	9	1	-14	0
		-1	6	-15	14	
2	1	-6	15	-14	0	
		2	-8	14		
	$1x^2$	$-4x$	7	0		

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(7)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{16 - 28}}{2}$$

$$x = \frac{4 \pm \sqrt{-12}i}{2}$$

$$x = \frac{4 \pm 2\sqrt{3}i}{2}$$

$$x = 2 \pm \sqrt{3}i$$

$2+\sqrt{3}i, 2-\sqrt{3}i$

12 = 2 · 2 · 3

If a+bi is a zero then a-bi is also a zero

$2+3i$ $2-3i$

If a+√bi is a zero then a-√bi is also a zero

$2+\sqrt{3}i$ $2-\sqrt{3}i$

$2-\sqrt{5}$ $2+\sqrt{5}$

ex. write a polynomial of least degree with rational coefficients, a leading coefficient of 1 and 3 and $2+\sqrt{5}$ as zeros.

$x = 3, 2+\sqrt{5}, 2-\sqrt{5}$

$(x-3)(x-(2+\sqrt{5}))(x-(2-\sqrt{5}))$

$(x-3)(x-2-\sqrt{5})(x-2+\sqrt{5})$

$(x-3)(x^2-4x-1)$

$x^3-4x^2-1x-3x^2+12x+3$

$x^3-7x^2+11x+3$

Sign Changes: (Descartes Rule)

+ real - the number of sign changes in f(x) or less by even number(-2).

7, 5, 3, 1

- real - then number of sign changes in f(-x) or less by even number(-2).

How many positive/negative real solutions?
Imaginary?

$$f(x) = x^6 - 2x^5 + 3x^4 - 10x^3 - 6x^2 - 8x - 8$$

+ real: 3, 1

$F(-x) = (-x)^6 - 2(-x)^5 + 3(-x)^4 - 10(-x)^3 - 6(-x)^2 - 8(-x) - 8$

$F(-x) = x^6 + 2x^5 + 3x^4 + 10x^3 - 6x^2 + 8x - 8$

- real: 3, 1

+ real	- real	Img	Total
3	3	0	6
3	1	2	6
1	3	2	6
1	1	4	6

Approximate the real zeros of

$$f(x) = x^6 - 2x^5 + 3x^4 - 10x^3 - 6x^2 - 8x - 8$$

Homework: Ch. 5.7 pg.383 #'s
4,6,10-14e,22,26,34,52,

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