Day 70

6.5/6.6 Notes Continued...

Find a third-degree polynomial equation with rational coefficients and the given roots.

① $1, 3i$ $= (x-1)(x-3i)(x+3i)$

$x=1$ $x=3i$ $x=-3i$

$x-1$

conjugate

multiply 1st

$x^2+3ix-3ix+9$

$(x-1)(x^2+9)$

$x^3+9x-1x^2-9$

$\boxed{x^3-1x^2+9x-9}$

② $-5, -2i$ $= (x+5)(x+2i)(x-2i)$

$x=-5$ $x=-2i$

$(x+5)$ $(x+2i)$

$x^2-2ix+2ix+4$

$(x+5)(x^2+4)$

$x^3+4x+5x^2+20$

$\boxed{x^3+5x^2+4x+20}$

6.6

① $x^4 - 5x^2 + 4 = 0$

$(x^2 - 4)(x^2 - 1) = 0$

$(x-2)(x+2)(x+1)(x-1) = 0$

$\boxed{x=2 \quad x=-2 \quad x=-1 \quad x=1}$

4 real solutions (all are rational)

② $x^4 + 7x^2 + 12 = 0$

$(x^2+4)(x^2+3) = 0$

$x^2+4=0 \qquad x^2+3=0$

$-4 \quad -4 \qquad -3 \quad -3$

$\sqrt{x^2} = \sqrt{-4} \qquad \sqrt{x^2} = \sqrt{-3}$

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

4 imaginary solutions

or it's possible

2 real, 2 imaginary if degree 4

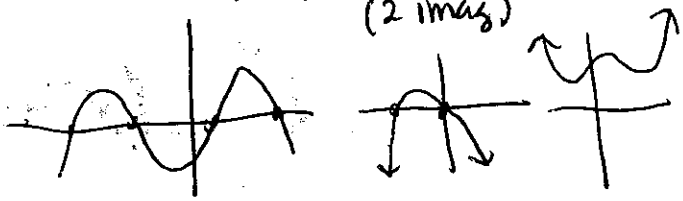
6.6 State the # of complex roots, the # of possible real roots, and possible rational roots.

ex 1) $1x^4 + 7x^2 + 12 = 0$

degree = # OF complex roots = 4

possible reals = 4, 2, 0

4 real; 2 real (2 imag); 0 real (all 4 imag)



# of possible rational roots: 12

List them 1st:

$\pm$ Factors constant / Factors L.C. $= \pm \frac{1, 2, 3, 4, 6, 12}{1}$

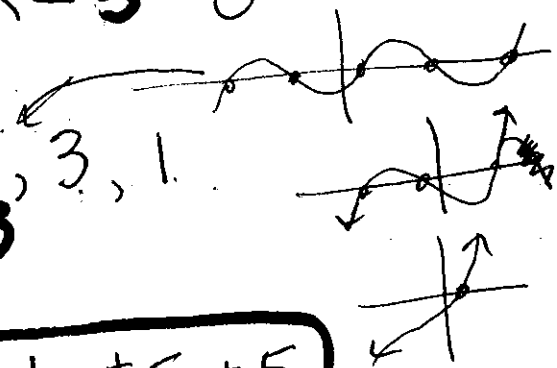
$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

ex 2) $-2x^5 - x^4 + x - 5 = 0$

complex = 5

pos. real = 5, 3, 1

pos. rational = 8



$\pm \frac{1, 5}{1, 2} = \pm 1, \pm \frac{1}{2}, \pm 5, \pm \frac{5}{2}$

ex3 $3x^3+4x^2+5x-6=0$

Complex: 3
pos. real: 3, 1 (1 real, 2 imag)
pos. rational: 1 2

list $\pm \frac{1,2,3,6}{1,3} = \pm 1, \pm\frac{1}{3}, \pm 2, \pm\frac{2}{3}, \pm 3, \pm 6$

$1, -1, \frac{1}{3}, -\frac{1}{3}$.

Find all zeros.

$y = 2x^3+x^2+1$ doesn't factor
✓ calculator for any roots

$x = -1$

	x^3	x^2	x	constant
-1	2	1	0	1
	↓	-2	1	-1
	2	-1	1	0

$2x^2-1x+1$

doesn't factor
quad. formula

$a=2 \quad b=-1 \quad c=1$

$b^2-4ac = (-1)^2-4(2)(1) = -9$

$x = \frac{1 \pm \sqrt{-9}}{2(2)}$

$x = \frac{1 \pm 3i}{4}$

complex = 3
real: 1 (2 imag)

p. 339 (2, 4, 6, 21, 23)
p. 343 (3-6, 10, 12, 16, 21, 22)