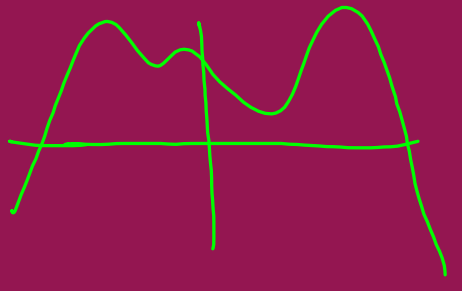
Polynomial & Rational Functions

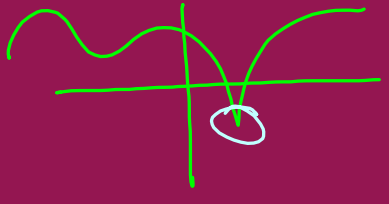
Polynomial – * one or more terms
* Whole # powers
  - no fraction exponents
  - no negative exponents

$x^6 - 3x^5 + 7x^3 - 2x + 9$

* characteristics of graphs of polynomials
* Solve polyn. equations

Characteristics:
* continuous – no holes, no asymptotes
* smooth, rounded turns





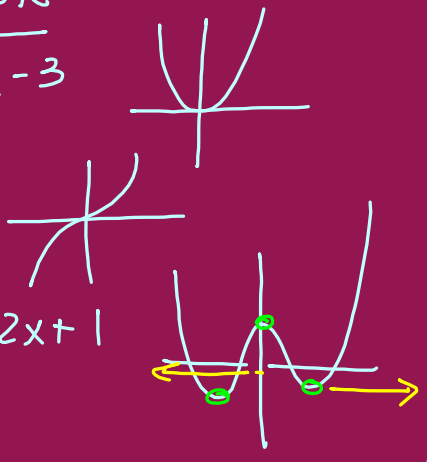
END BEHAVIOR

$y = x^2$ $x^2 + 2x - 3$

$y = x^3$

$y = 2x^4 + 3x^3 + 2x + 1$

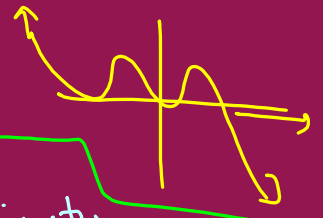
leading coeff



$f(x) = -3x^5 + 7x^2 - 4x + 1$

$\lim_{x \to -\infty} f(x) = +\infty$ ← y-coor

$\lim_{x \to \infty} f(x) = -\infty$



Degree of a polyn = highest power

odd degree = ends go in opposite direction

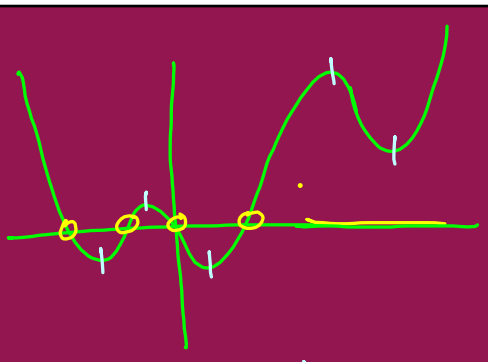
even degree = ends go in same direction

Leading coeff is negative = end behavior switches

Max Total # of Rel. Max + Min = Degree − 1

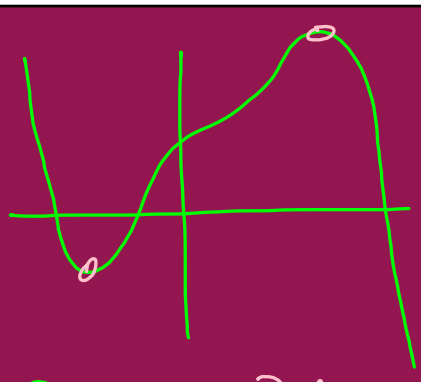
Max # of x-int = Degree

↳ real zeros



Degree = x^6 or a greater even power

Leading coeff = +



Degree = 3rd x^3

Leading coeff = −

Solving Polynomials

$(2x^3 - 8x^2)(+3x - 12) = 0$

Factor by Grouping if 4 terms.

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

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

$x = 4$

$2x^2 + 3 = 0$

$\frac{2x^2}{2} = \frac{-3}{2}$

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

$= \pm i\frac{\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$= \pm \frac{i\sqrt{6}}{2}$

Solve $2x^5+3x^4-x^3+9x^2-55x-30=0$

$(x^2\ \ )(2x+1)(x\ \ )(x\ \ )$

$x=2$

2	2	3	−1	9	−55	−30
	+	4	14	26	70	30
	2	7	13	35	15	0

$(x-2)(2x^4+7x^3+13x^2+35x+15)$

−3	2	7	13	35	15
	+ −	−6	−3	−30	−15
	2	1	10	5	0

$(x-2)(x+3)(2x^3+x^2+10x+5)$

$x^2(2x+1)+5(2x+1)$

$(x-2)(x+3)(2x+1)(x^2+5)$

$x=2 \quad x=-3 \quad x=-\frac{1}{2} \quad \sqrt{x^2}=\sqrt{-5}$

$x=\pm i\sqrt{5}$

$\pm 1 \quad \pm 30$
$\pm 2 \quad \pm 15$
$\pm 3 \quad \pm 10$
$\pm 5 \quad \pm 6$

$\pm 1 \quad \pm 2$

1) Find a # that makes eq. = 0
2) Put that # in box + do synthetic division.
3) Write out new factors + solve
   OR
   Repeat, if needed