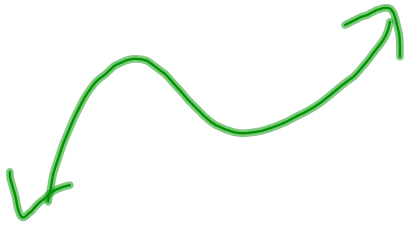
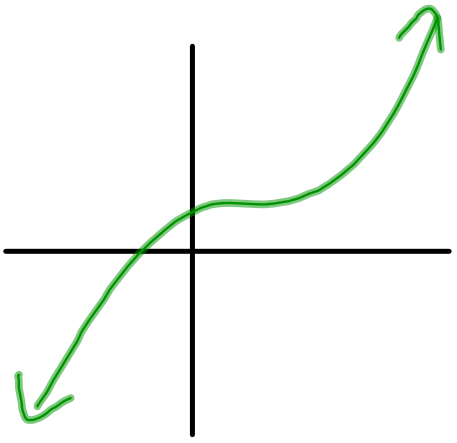
4.4 Graphs of Poly Functions



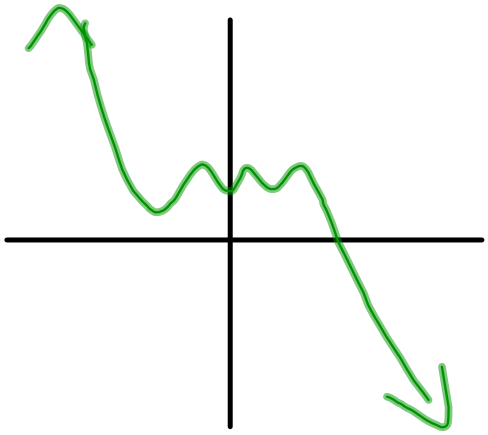
End behavior of poly graphs:

-- look at the leading term ax^n

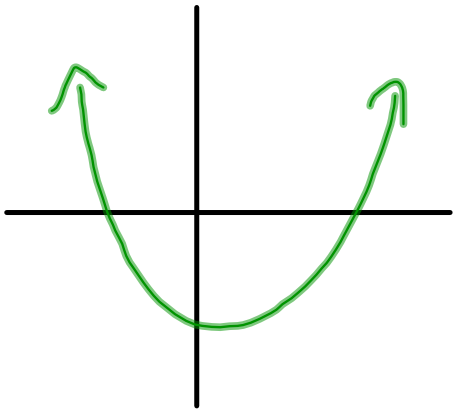
If a>0 & n is odd
--rise to the right.
--ends are opp.



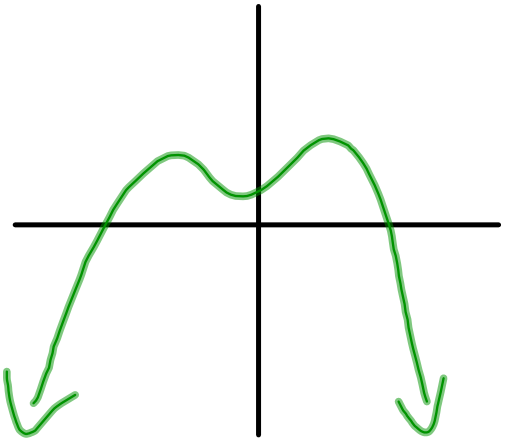
If a<0 & n is odd
--fall to the right.
--ends are opp



If a>0 & n is even
--both ends rise.



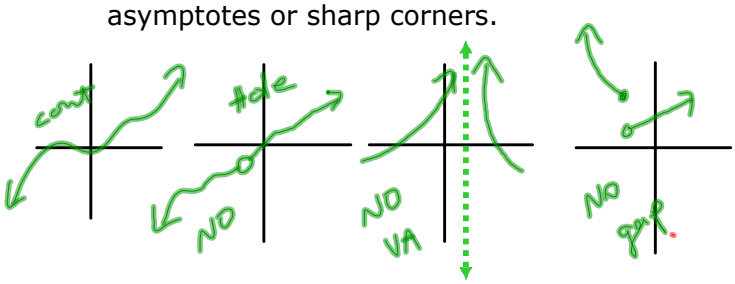
If a<0 & n is even
--both ends fall.



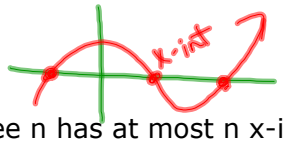
Properties of Poly's

Continuity

-- all poly's are continuous.
-- smooth unbroken curve.
-- no holes, gaps, jumps, vertical asymptotes or sharp corners.



x-intercepts



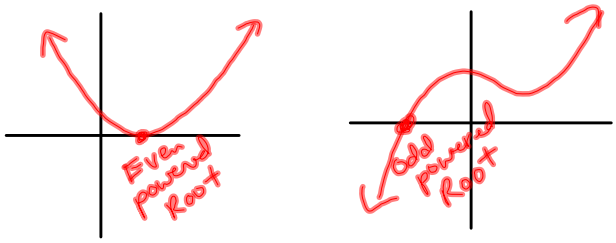
-- Roots, Zeros
-- a poly of degree n has at most n x-int's.

→ y = 0

Multiplicity of roots

If a root c has an even multiplicity, then the graph touches but doesn't cross the x-axis.

If a root c has an odd multiplicity, then the graph crosses the x-axis at that point.

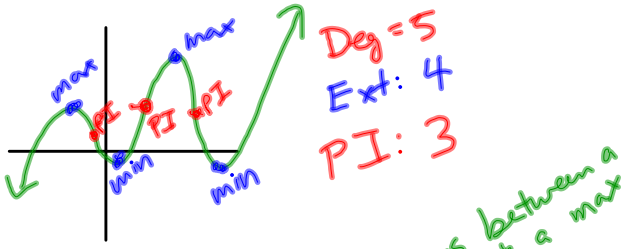


Local Extrema

Local Max -- a peak or high point
Local Min -- a valley or low point

A poly of degree n has at most (n-1) local extrema.

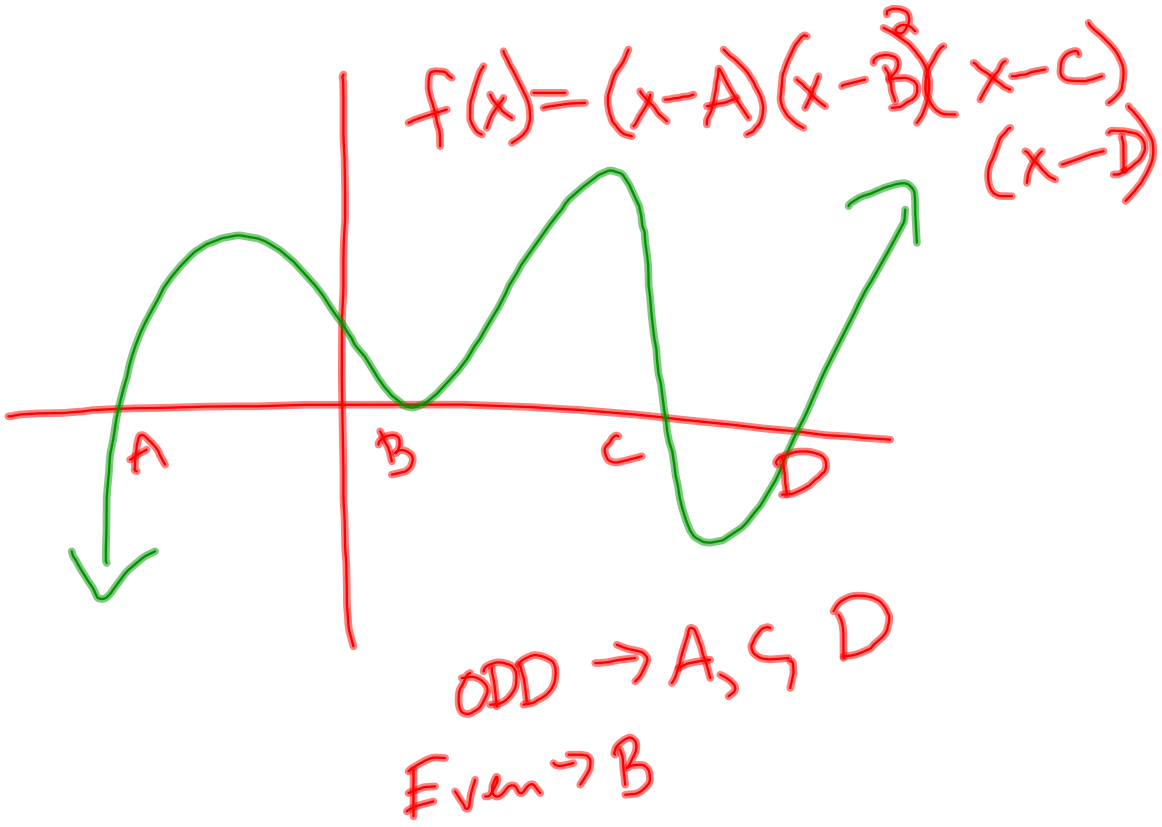
If degree = 5, there can only be 4 extrema.



Points of Inflection (P.I.) → always between a min & a max

-- a point where the graph changes the direction it is bending (bend up or down)

A poly of degree n has at most (n-2) points of inflection. (If degree = 5, only 3 P.I.'s)


f(x) = (x-A)(x-B)²(x-C)
(x-D)
A
B
C
D
ODD → A, C, D
Even → B

Find a complete graph for each poly function, then find all local extrema. And Roots

1) $x^4 + 10x^3 + 21x^2 - 40x - 80$

Roots (−1.53, 0) (1.89, 0)

max (−3.14, 40.27)

min (−5, 20) (.64, −94.21)

2) $x^3 - 1.8x^2 + x + 2$

Roots = (−.71, 0)

min (.76, 2.16)

max (.44, 2.18)

hw p239 # 1-12, 19-24

P241 #43, 44, 48-54 e, 59,62