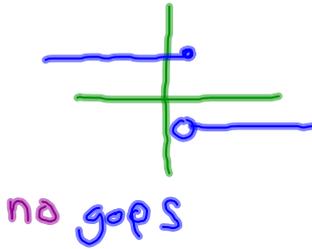
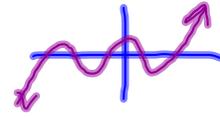


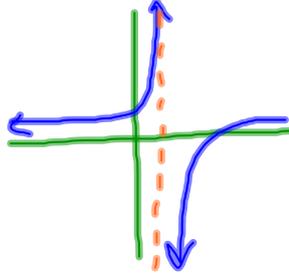
Section 1.5B: Analyzing Zeros & Graphs

Polynomials are continuous functions!

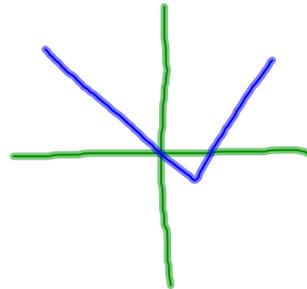
They are smooth curves
No discontinuities



no gaps



no hole

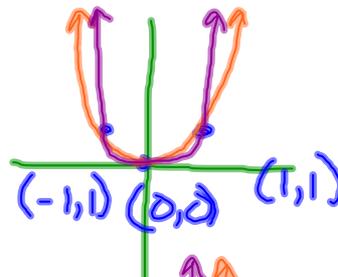


no sharp turns

Graphs of the form $f(x) = x^n$

n is even

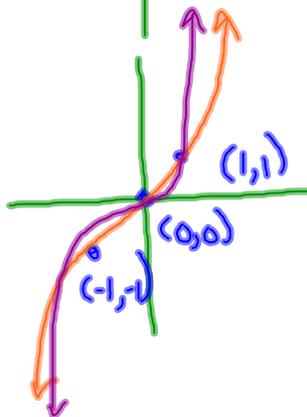
as n increases
squarer



parabolic

n is odd

as n increases
squarever



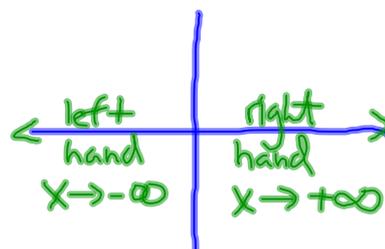
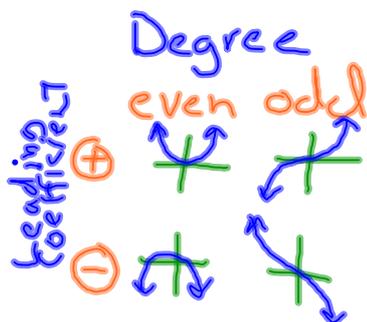
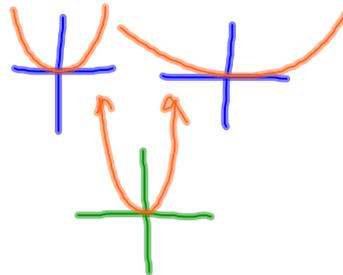
sigmoidal

Graphs of the form $f(x) = \underline{ax}^n$

$a < 0$ flips graph over x-axis
reflections

$|a| < 1$ widens graph
shrink

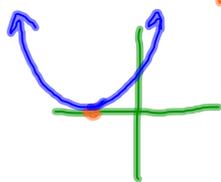
$|a| > 1$ narrows graph
stretch



Zeros

A polynomial can have as many ^{real} zeros as its degree

Sometimes it will have less.



Multiplicity (k) \leftarrow repeats

$$x^2 + 6x + 9$$

$$(x+3)(x+3) \leftarrow \text{double root } k=2$$

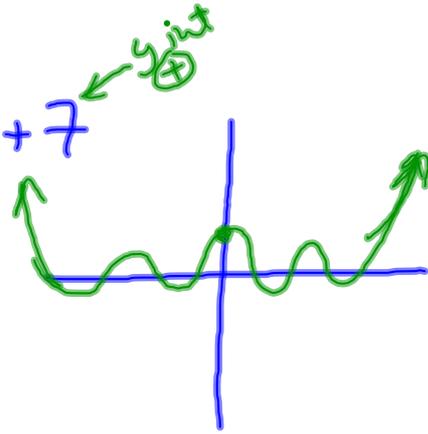
if k is even graph touches x-axis

if k is odd graph crosses x-axis

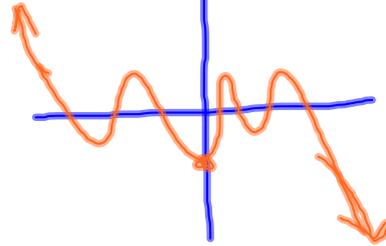
Sketch:

$$f(x) = 6x^8 + 3x^5 - 2x^3 + 7$$

\oplus ↑
 even^o
 $a_8 = 8$ zeros



$$f(x) = -3x^7 + 2x^6 + 8x^2 - 17$$



$$y = \frac{1}{2}(x+2)^2 - 3$$

↑ wider
 ↑ left + 2
 ↑ down 3

$$f(x) \rightarrow \pm a f(\pm x - c) + d$$

\ominus flip x
 |a| < 1
 wider (shrink)
 |a| > 1
 Narrower (stretch)

↑ Vertical shift
 \oplus up
 \ominus down

\ominus flip y
 Horizontal Shift
 \oplus left
 \ominus right

Finding Polynomials with specific Zeros

Zeros 2, -8, 0

factors $(x-2)(x+8)x$

multiply $(x^2+6x-16)x = x^3+6x^2-16x$