GRAPHS OF POLYNOMIALS – rollercoaster

smooth, continuous curves

– no sharp pts, no holes, no asymptote

Key Characteristics

Max #: Degree – 1

# of relative max/min.: (local) (peaks/valleys)

# of zeros: Degree (x-int)

End Behavior:
- Odd degree: down/up
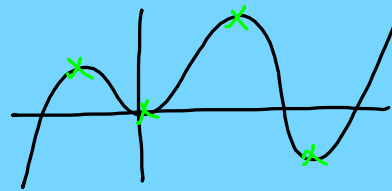- Even degree: up/up $\Big\}$ +l.c.

Leading coefficient:
coeff on highest power term

up/down
down/down $\Big\}$ – l.c.

Multiplicity $\Big\rangle$

Crosses through the x-axis: Odd multiplicity
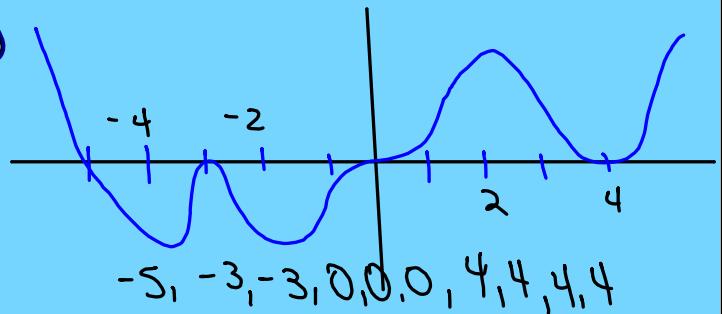
"bounces" off x-axis = even multiplicity

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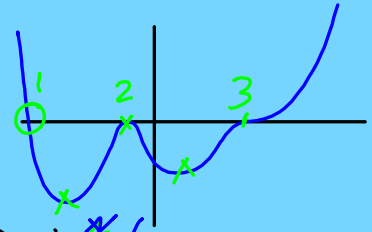
Degree: 5

-5, -3, -3, 0, 0, 0, 4, 4, 4, 4
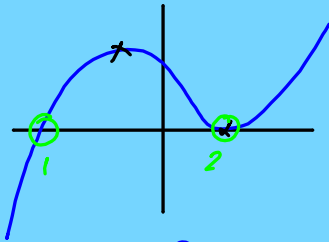
Degree: 3
leading coeff: +
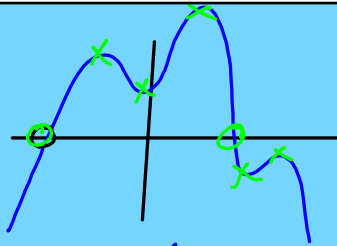
$g(x) = x^4 - 4x^3 - 2x^2 + 16x - 12$

Degree: 4

End behavior: Up/Up

y-int: Let x = 0
$(0, -12)$

$(0,)$

Deg: 6
L.C.: −

Deg: ✱ 6
L.C.: +

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

Degree: $x^2 \cdot x^3 \cdot x^2 = x^7$
7th

End behavior: Up/down

y-int: $-(3)(4)^3(-1)^2$
$= -3 \cdot 64 \cdot 1$
$= -192$
$(0, -192)$
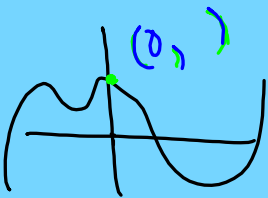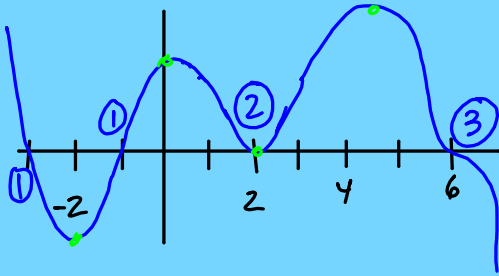
Degree: ~~5~~ 7

Zeros: $-3, -1, 2, 6$

$f(x): -(x+3)(x+1)(x-2)^2(x-6)^3$

Domain: $(-\infty, \infty)$

Range: y-coord: Low to High

$(-\infty, \infty)$

Range: $(-\infty, 6]$

Guidelines for Sketching Polynomials

1) Determine end behavior

2) Find y-int

3) Find Zeros

4) Use y-int, end behavior, multiplicities and mid-interval points to sketch continuous curve

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

End Behav: 4th even, +
     up/up

y-int: $f(0) = 8$ $(0,8)$

Zeros: $-1, 2, 4$
        2

$-1 \underline{|\ 1\ -4\ -3\ \ 10\ \ 8}$
$\underline{\quad\quad -1\ \ 5\ -2\ -8}$
$\quad\ \ 1\ -5\ \ 2\ \ 8\ \ \ 0$

$(x+1)(x^3 - 5x^2 + 2x + 8) = 0$

$-1 \underline{|\ 1\ -5\ \ 2\ \ 8}$
$+ \underline{\quad\quad -1\ \ 6\ -8}$
$\quad\ \ 1\ -6\ \ 8\ \ \ 0$

$(x+1)^2(x^2 - 6x + 8)$
$(x+1)^2(x-2)(x-4)$
$\quad\quad -1, 2, 4$

$1 | 1 - 4 - 3 + 10 + 8 = 12$
$3 | 81 - 108 - 27 + 30 + 8 = -16$

Graph page
$f_1(x) = \sim\sim\sim$
Table

$\underline{\quad\quad\quad} | x = \#$
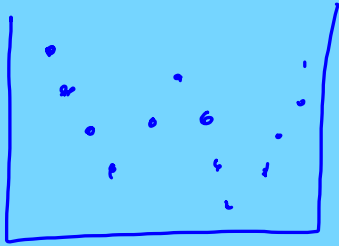
Cubic Regression
Quartic Regression

1) New Doc- Spreadsheet
   <u>year</u>   <u>cost</u>

2) Add Data & Stat page
   Show Cubic/Quartic
   Regr.

3) Go back to SS.
   Run Reg--ssion again
   Menu-Stats-