7.3 Polynomial Behavior

Essential Question

How do I graph a polynomial without using a calculator?

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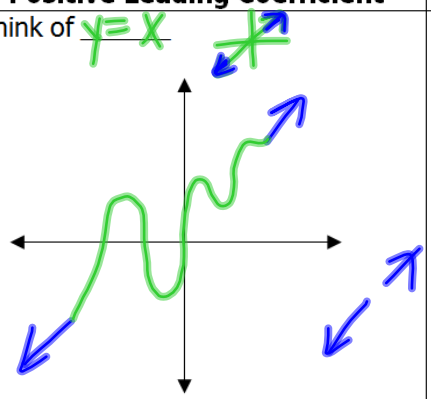
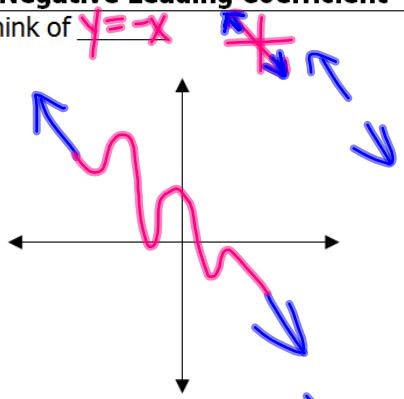
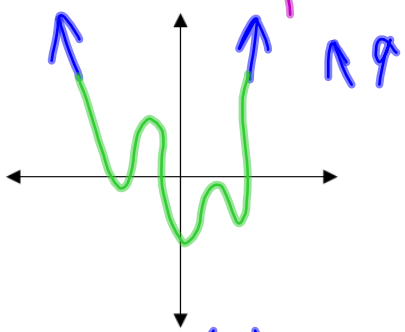
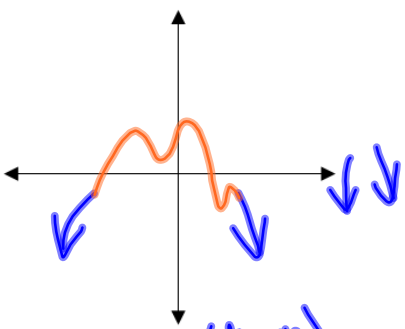
1. End Behavior – The graph's behavior as x approaches ±∞.

	Positive Leading Coefficient	Negative Leading Coefficient
Odd degree	Think of $y=x$  As $x\to\infty$, $y\to$ ∞ (up) As $x\to-\infty$, $y\to$ −∞ (down)	Think of $y=-x$  As $x\to\infty$, $y\to$ −∞ (down) As $x\to-\infty$, $y\to$ ∞ (up)
Even Degree	Think of $y=x^2$  As $x\to\infty$, $y\to$ ∞ (up) As $x\to-\infty$, $y\to$ ∞ (up)	Think of $y=-x^2$  As $x\to\infty$, $y\to$ −∞ (down) As $x\to-\infty$, $y\to$ −∞ (down)

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2. Y-Intercept – Plug in 0 for x.
   - Easiest to find in not factored form.

ex $3x^4 - 4x^2 + 3x - 7$ (0, -7)

Roots, solutions, zeros

3. X-Intercepts – POLYNOMIAL NEEDS TO BE IN factored form.
   - Set each factor equal to 0.

ex $x(x-3)^3(x-2)^4(x+7)$

$x=0$ $x-3=0$, $x=3$ $x-2=0$, $x=2$ $x+7=0$, $x=-7$

zeros: 0, 3, 2, -7

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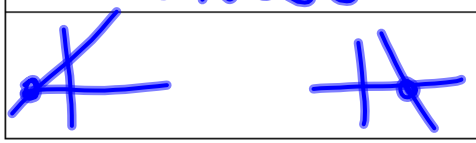
4. Multiplicity (behavior at each x-intercept) – depends on the degree of the factor.

Multiplicity		
1 ex. $x+3$, x	Even ex. x^2, $(x-2)^4$	Odd $(x-4)^5$, x^3
CROSS	TOUCH	WIGGLE
		

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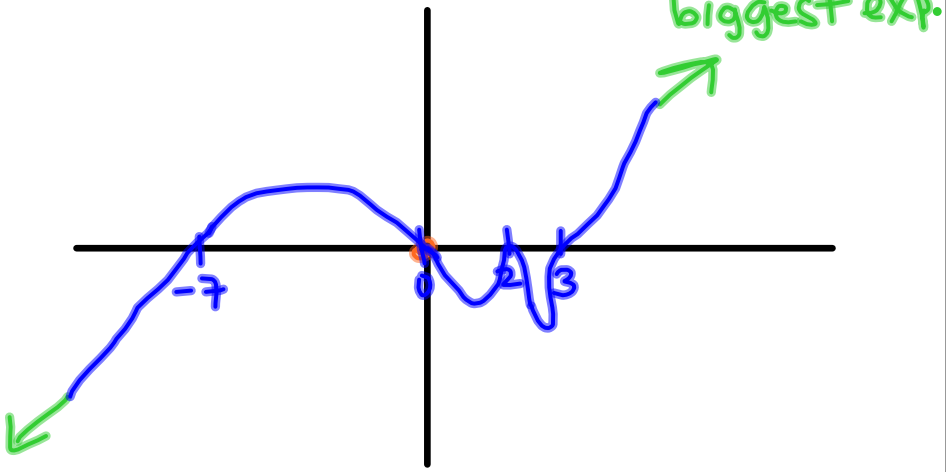
Example $x(x-3)^3(x-2)^4(x+7)$

Factored → add exp.
Not factored → biggest exp.

End Behavior:

degree: 9
ODD
+ LC



Y-intercept x=0

(0,0)

X-intercept

zeros:	0	3	2	-7
mult	1	3	4	1
	C	W	T	C

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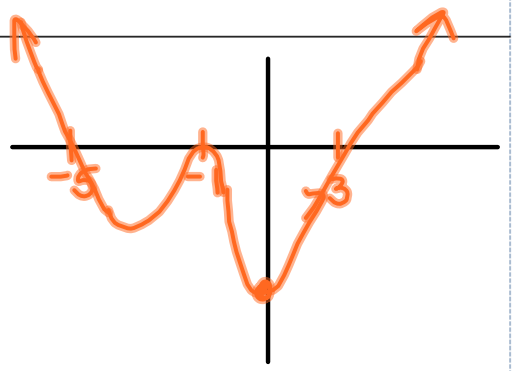
Optional Example...

Function	Highest Powered Term	Zeros	Graph
$2(x+1)^2(x-3)^1(x+5)^1$ y-int: $2(0+1)^2(0-3)(0+5)$ $2(1)(-3)(5) =$ $(0, -30)$	$2x^4$ – – – EVEN +LC ↑ ↑	-1 3 -5 + C C	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