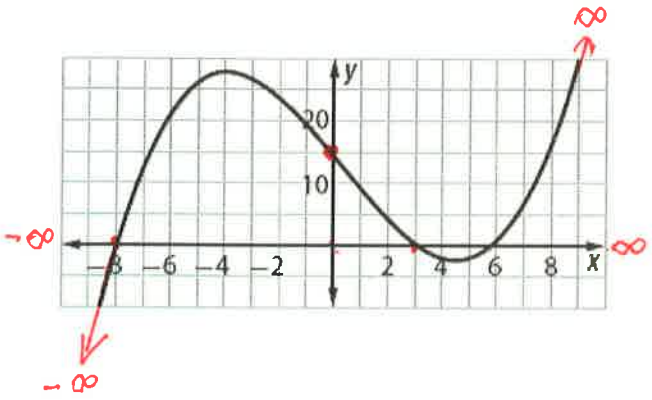
Math 3 Honors Unit 2 Day 2 **Polynomial Graphs – Degree, Zeros, Local Min/Max, End Behavior**

SWBAT: determine the Degree, Zeros, Local Min/Max, End Behavior of a polynomial from its graph.

ROOTS
SOL
x-int

WARM UP

Consider the graph of the polynomial function shown below.



a. Zeros: $x = 6, 3, -8$

b. End Behavior: $x \to \infty \quad y \to \infty$

$x \to -\infty \quad y \to -\infty$

c. Degree: 3

d. What is the smallest possible degree for this polynomial function? Explain your reasoning. degree 3 because there are 3 real zeros x-int

e. Use a line of best fit to find a polynomial function rule that models the graph pattern. List the points you use as the basis of your curve fitting.

Points: (6, 0) (3, 0) (-8, 0) (0, 15)

STAT/EDIT/L1, L2
x y

Function rule: $y = .10x^3 - .10x^2 - 5.63x + 15$

STAT/CALC/CUBIC Reg
Vars
y vars
function
y1

curve fitting

When finding a line of best fit, how many points will you need to determine:

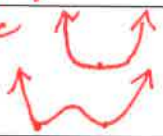
A line? 2 (x^1) A parabola? 3 (x^2)

A Cubic? 4 A Quartic? 5

What would you use for a general rule?

one more point than the # of the degree

Review from Math 2:

Polynomial/Graph	Domain	Range	End Behavior	Absolute Max/Min
linear $y = x$ 	all real #s $\mathbb{R}$	$\mathbb{R}$	$x \to \infty \quad y \to \infty$ $x \to -\infty \quad y \to -\infty$	none
quadratic $y = x^2$ 	$\mathbb{R}$	$y \geq$ vertex	$x \to \infty \quad y \to \infty$ $x \to -\infty \quad y \to \infty$	always at the vertex
cubic $y = x^3$ 	$\mathbb{R}$	$\mathbb{R}$	$x \to \infty \quad y \to \infty$ $x \to -\infty \quad y \to -\infty$	none
quartic $y = x^4$ 	$\mathbb{R}$	$y \geq$ abs min	$x \to \infty \quad y \to \infty$ $x \to -\infty \quad y \to \infty$	always

What can we say about these polynomials in general?

even deg. polys – same D, R, end beh, abs m/min

odd degree – " " " "

Terms You Need to Know:

Polynomial: any # of alg. expressions joined by + or –

Domain: set of all possible x values

Range: " y values

End Behavior:

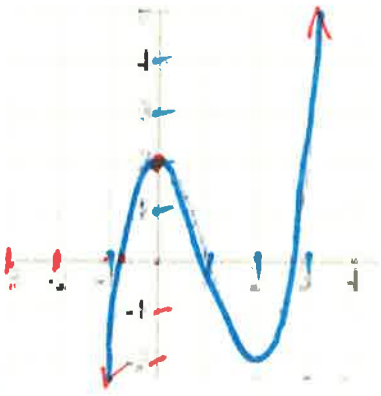
Absolute Max/Min: $\geq$ every other point in the graph

$\leq$ " " " "

Local Max/Min: the highest / lowest point on an interval

Given the following graphs, determine the zeros, lowest possible degree, Absolute and Local Min/Max if there are any, end behavior.

1.



Zeros: $x = -.8, .8, 2.7$

Lowest possible degree: cubic

Absolute Min/Max: none

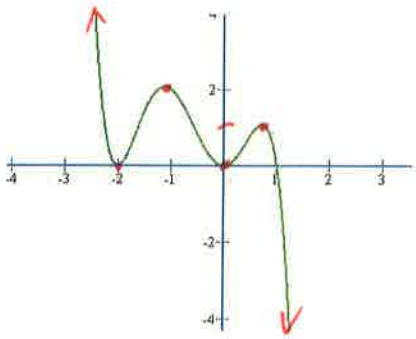
Local Min/Max: L max $(0, 2)$ L min $(2, -2)$

End Behavior: $x \to \infty \quad y \to \infty$
$x \to -\infty \quad y \to -\infty$

Possible Function rule: $y = 1.16x^3 - 3.13x^2 + .74x + 2$

$(0, 2)$
$(-.8, 0)$
$(.8, 0)$
$(2.7, 0)$

2.



Zeros: $x = 0, -2, 1$

Lowest possible degree: 5 quintic

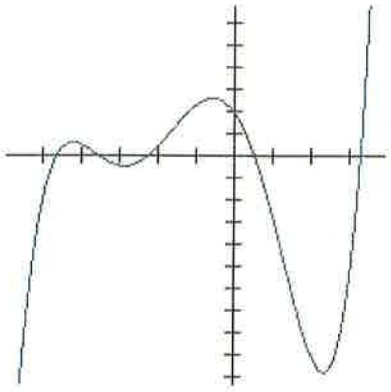
Absolute Min/Max: none

Local Min/Max: 4: min $(-2, 0)(0, 0)$ max $(-1, 2)(.6, 1)$

End Behavior: $x \to \infty \quad y \to -\infty$
$x \to -\infty \quad y \to \infty$

Possible Function rule: _____

3.



Zeros: _____

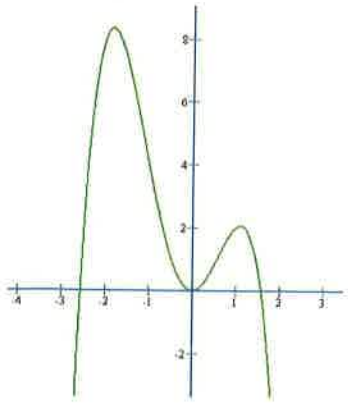
Lowest possible degree: _____

Absolute Min/Max: _____

Local Min/Max: _____

End Behavior: _____

Possible Function rule: _____

3. 

Zeros: _____

Lowest possible degree: _____

Absolute Min/Max: _____

Local Min/Max: _____

End Behavior: _____

Possible Function rule: _____

In Closing:

The lowest possible degree is determined by… # x-int, end beh

Absolute Min/Max can occur only when … even degrees

Can you have two Absolute Min/Max? yes

The number of Local Min/Max can be… one less than degree

End Behavior is determined by… even or odd degree

Exit Ticket: Draw a graph and write an equation of a function that has

- **1 x-intercept**
- **1 local maximum**
- **1 local minimum**
- **a degree of 3**

y = _____