

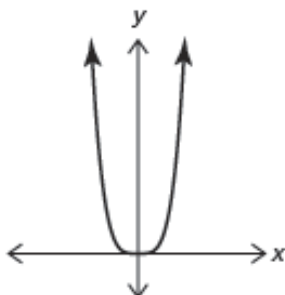
Sec. 4.4 – Polynomial Characteristics

The **absolute maximum** is the highest point in the entire graph, and the **absolute minimum** is the lowest point in the entire graph. The set of absolute maximums, absolute minimums, relative maximums, and relative minimums may also be referred to as **extrema**. (relative extrema: list of all)

Determine the number of extrema for each polynomial:

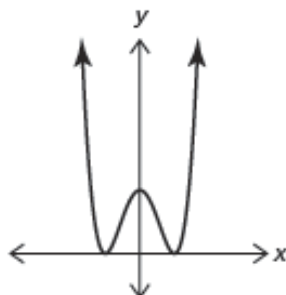
4th Degree Polynomials

$$g_1(x) = x^4$$



Number of Extrema: _____

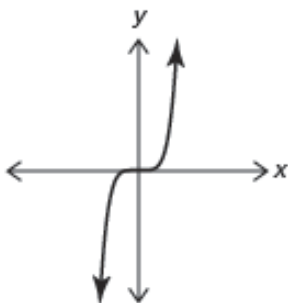
$$g_2(x) = x^4 - 3x^2$$



Number of Extrema: _____

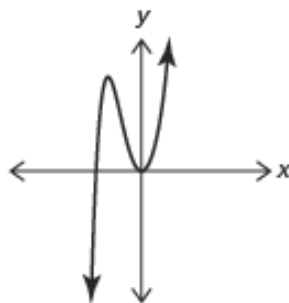
5th Degree Polynomials

$$f_1(x) = x^5$$



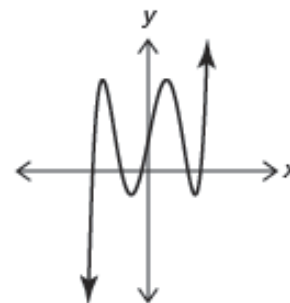
Number of Extrema: _____

$$f_2(x) = x^5 + 4x^2$$



Number of Extrema: _____

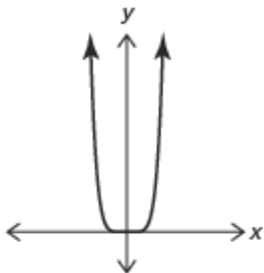
$$f_3(x) = x^5 - 5x^3 + 5x + 1.18$$



Number of Extrema: _____

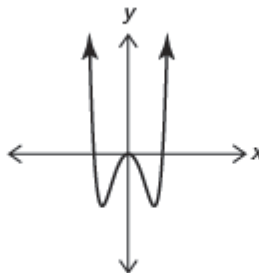
6th Degree Polynomials

$$h_1(x) = x^6$$



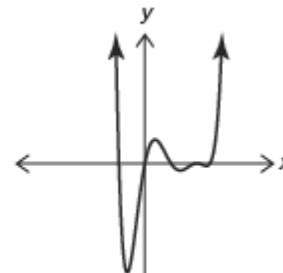
Number of Extrema: _____

$$h_2(x) = x^6 - 3x^2$$



Number of Extrema: _____

$$h_3(x) = 2x^6 - 13x^5 + 26x^4 - 7x^3 - 2$$



Number of Extrema: _____

What observations do you notice about the possible number of extrema and the degree of the polynomial?

List the possible number of extrema for each polynomial below:

a. 9th degree polynomial

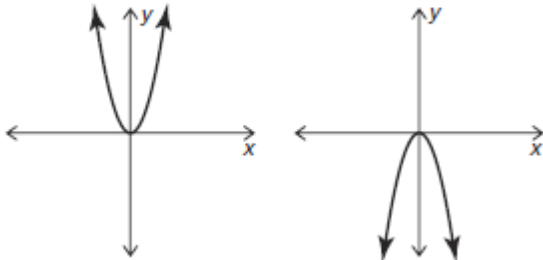
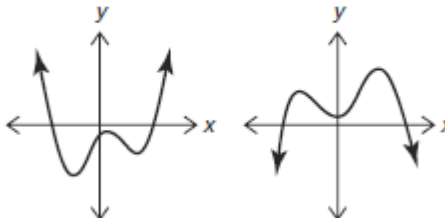
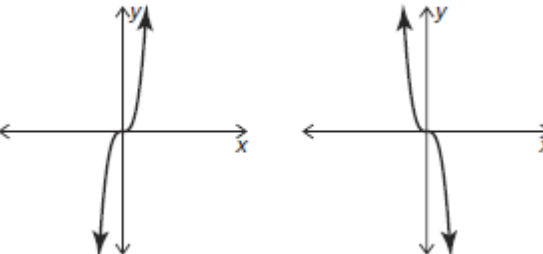
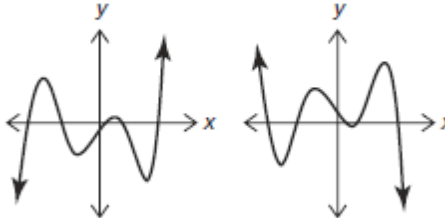
b. 18th degree polynomial

c. n th degree odd polynomial

d. n th degree even polynomial

Go back to the front page, and label the multiplicity of all roots. They must add up to the degree of the polynomial.

Analyze the graphs shown and answer the following questions.

Even Degree Power Functions	Even Degree Polynomial Functions
	
Odd Degree Power Functions	Odd Degree Polynomial Functions
	

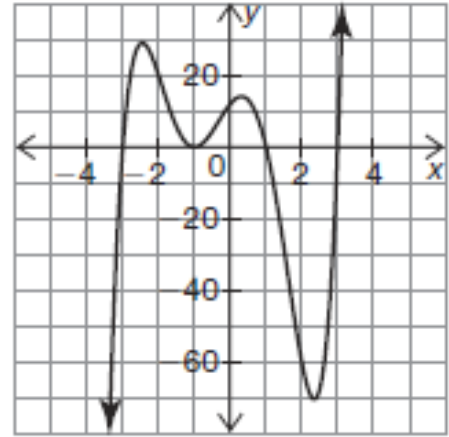
Label the end behavior of the graphs above.

What conclusions can you make about the end behavior of all even degree polynomials?

What conclusions can you make about the end behavior of all odd degree polynomials?

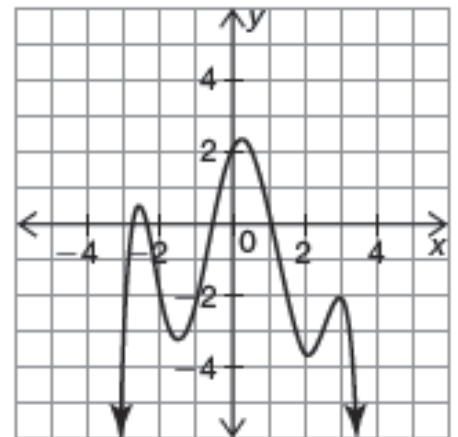
Example 1: Consider the graph shown.

- is the a -value of this function positive or negative?
- Is the degree of the function even or odd?
- What is the least possible degree for the function?
- State the domain and range of the function.
- Determine the number of relative extrema for the graph.
- Determine the number of absolute extrema for the graph.

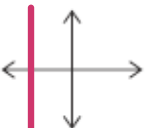
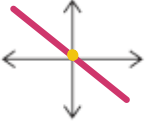
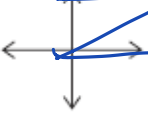
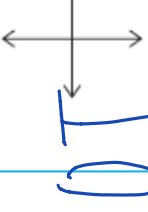


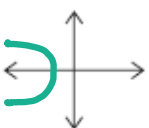
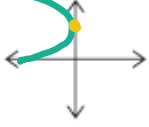
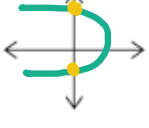
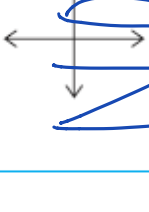
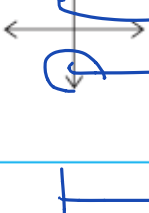


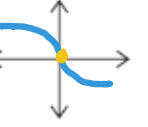
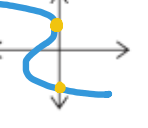
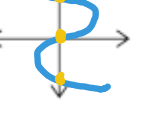


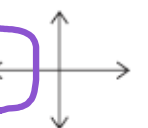
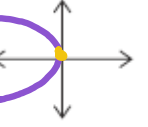
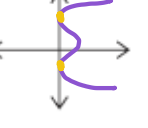
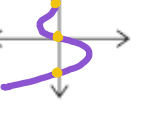
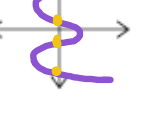



Example 2: Consider the graph shown.

- is the a -value of this function positive or negative?
- Is the degree of the function even or odd?
- What is the least possible degree for the function?
- State the domain and range of the function.
- Determine the number of relative extrema for the graph.
- Determine the number of absolute extrema for the graph.



The following chart shows a sketch of the basic shape on each set of axes given the number of zeros. Why do you think some sketches are not possible?

	No Zeros	1 Zero	Exactly 2 Zeros	Exactly 3 Zeros	Exactly 4 Zeros	Exactly 5 Zeros
Linear						
Quadratic						
Cubic						
Quartic						
Quintic	