Name _____ Date _____

Polynomials and End Behavior Notes

Example 1… Write each polynomial in standard form. → descending exponent order

a. $x^2 + x^3 - 9$

$x^3 + x^2 - 9$

b. $2a(a^2 - 4)$

$2a^3 - 8a$

A polynomial can be classified, or grouped, according to the number of terms it has, and according to the degree (highest exponent).

Degree	Name	Example	# Terms	Name	Example
0	Constant	3	1	Monomial	
1	Linear	$x-2$	2	Binomial	
2	Quadratic	x^2-3x	2	Binomial	
3	Cubic	x^3-4x^2+2	3	Trinomial	
4	Quartic	x^4-3x^2+2x-1	4	Poly. w/4 terms	
5	Quintic	$3x^5$	1	Monomial	
6	6th degree				

Example 2… Classify each polynomial by degree and number of terms.

a. $5x^4 - 7$

Degree: 4

Terms: 2

Quartic Binomial

b. $3x^3 - x^2 + 6$

Cubic Trinomial

Example 3… Simplify each polynomial, then classify by degree and number of terms.

a. $(7x^2 + 8x - 5) + (9x^2 - 9x)$

$16x^2 - x - 5$

Quadratic Trinomial

b. $(3x^3 - 4x + 1) - (1 - 4x + x^2)$

$3x^3 - 4x + 1 - 1 + 4x - x^2$

$3x^3 - x^2$

Cubic Binomial

Example 4… Find a cubic model (equation) for the following set of points. (Calculator)

(-2, -7), (-1, 0), (0, 1), (1, 2), (2, 9)

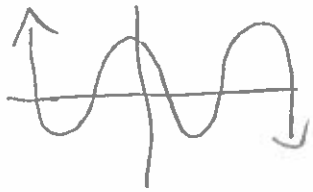
$y = x^3 + 1$

The end behavior of a polynomial function is the behavior of the graph of $f(x)$ as x approaches positive or negative infinity. The degree and the leading coefficient of a polynomial function determine the end behavior of the graph.

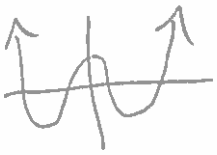
Polynomial	Leading Coefficient (+ / −)	Degree (Even/odd)	End Behavior
$P(x) = 3x^4 - 4x^3 - 6x + 8$	3 Pos.	4 Even	↑ ↑
$P(x) = -2x^2 + 5x - 2$	-2 Neg.	2 Even	↓ ↓
$P(x) = 2x^3 - 9$	2 Pos.	3 Odd	↓ ↑
$P(x) = -x^5 - 4x^3 + x$	-1 Neg.	5 Odd	↑ ↓
	(right side)	(left side)	

Example 5... **Determine the end behavior for the following polynomials and sketch a basic graph.**

a. $-2x^5 + 4x^3 - x - 5$ 4 turns ↑ ↓

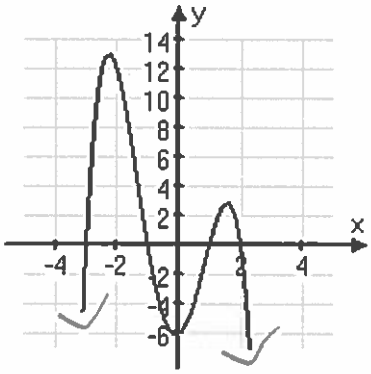


b. $x^4 - 5x^2 + 2x + 6$ 3 turns ↑ ↑



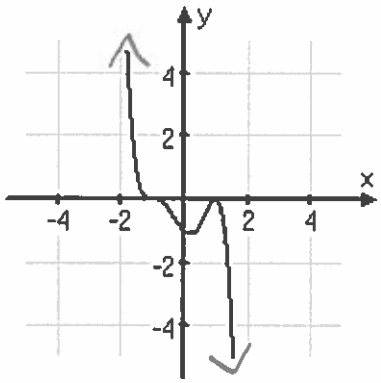
Example 6... **Identify whether the following graphs have an odd or even degree and a positive or negative leading coefficient.**

a.



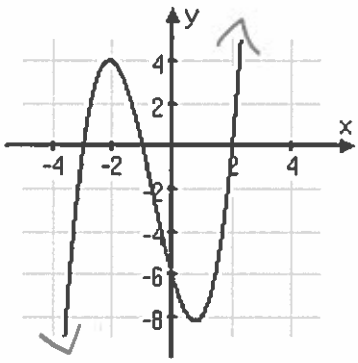
Negative Even

b.



Negative Odd

c.



Positive Odd