VOCABULARY

Monomial –a real number, a variable, or a product of real numbers and variables with whole number exponents

$2x$ or $5x^2$

Single term

Degree of a monomial – the exponent of the variable if there is only one variable, or the sum of the exponents if there is more than one variable

Polynomial – a monomial or the sum of monomials

many terms $3x^2+5x-1$

Degree of a polynomial – the greatest degree among the monomial terms.

highest exponent

Polynomial function – a polynomial in the variable x

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

Standard form of a polynomial – arrange the terms by degree in descending numerical order. A polynomial function $P(x)$, where n is a nonnegative integer and $a_n, \ldots, a_0$ are real numbers.

$$P(x) = a_n x^n + a_{n-1}x^{n-1} + \ldots + a_1 x + a_0$$

Turning point –a point where the graph of a function changes direction from upwards to downwards or from downwards to upwards

End behavior – the direction of the graph of a function as you move to the left and to the right, away from the origin.

Names By Degree		
Degree	**Name By Degree**	**Polynomial Example**
0	constant	10
1	linear	x $2x-3$
2	quadratic	x^2+2x-1
3	cubic	x^3+3
4	quartic	$2x^4-3x$
5	quintic	$-x^5+3x^2-1$

Number of Terms	Name By Terms	Polynomial Example
1	monomial	$2x$
2	binomial	$3x-5$
3	trinomial	x^4-6x^2+2
4	polynomial	$3x^5-6x^3+x-3$

EX #1: Write each polynomial in standard form.
Name the polynomial by degree and by number of terms.

A. $4x^2 - 3x + 5x^4$

$5x^4+4x^2-3x$ Quartic trinomial

B. $2 + x^3 - 3x^2 + 7x$

x^3-3x^2+7x+2 Cubic Polynomial

C. $8 + 3x$

$3x+8$ Linear binomial

D. x^7 A monomial of degree 7.

The degree of a polynomial affects the shape of its graph and determines the maximum number of **turning points**. It also affects the **end behavior** of a function.

EVEN FUNCTIONS

UP AND UP

3 turns

$y = x^4 - 3x^3 + 4x$

degree 4

DOWN AND DOWN

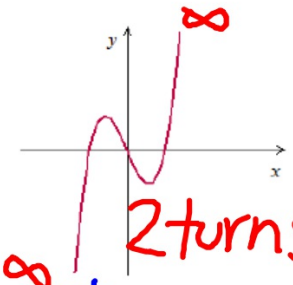
1 turn

$y = -x^2 + 4x$

degree 2

ODD FUNCTIONS

DOWN AND UP

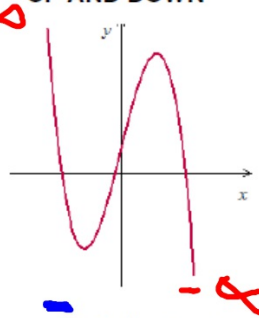


2 turns

$y = x^3 - 2x$

degree: 3

UP AND DOWN



2 turns

$y = -0.5x^3 + 4x + 1$

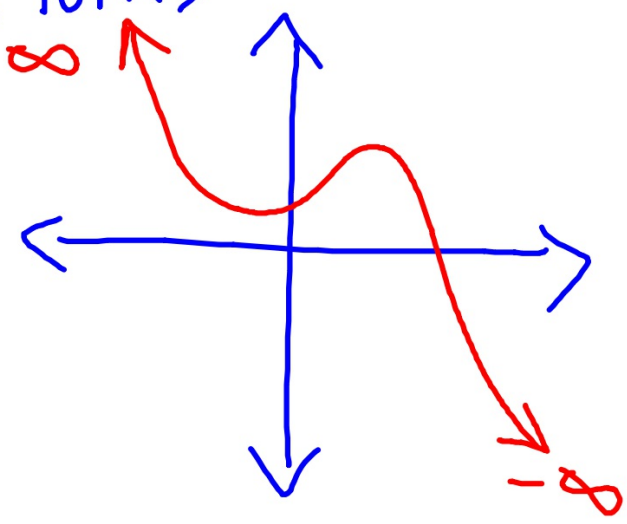
degree: 3

EX #2: Consider the leading term of $y = -4x^3 + 2x^2 + 7$. What is the end behavior of the graph? Sketch a general shape of the function.

Degree: 3 $\Rightarrow$ ODD

Negative: $-4 \Rightarrow$

Turning points: 2 turns



EX #3: Graph $y = x^3 - 1$

positive ⇒ ↗

Degree 3 ⇒ ODD ↘

Turns ⇒ 2

x	f(x)

EX #4: Graph $y = -x^3 + 2x^2 - x - 2$