

What are Polynomials?

- **Polynomial:** Expressions involving a variable that can be one to infinite terms long
- **Standard Form:** polynomial whose terms are listed in order from the highest to the lowest exponent value
- **Degree:** the same value as the highest exponent
- **Leading coefficient:** the coefficient of the term that contains the degree.

How do we know it's a polynomial?

- ALL exponents have to be whole numbers!
- This means no negative numbers, no fractions, no radicals in the exponents.
- Is it a polynomial? If so, what is the standard form? Degree?
- a)  $f(x) = -2x^3 + 5x + 8$  b)  $g(x) = -0.8x^3 + \sqrt{2}x^4 - 12$
- Yes,  $-2x^3 + 5x + 8$ , D: 3      Yes!  $\sqrt{2}x^4 - 0.8x^3 - 12$ ; D: 4
- c)  $h(x) = -x^2 + 7x^{-1} + 4x$  d)  $k(x) = x^2 + 3^x$
- No;  $x^{-1}$       No;  $3^x$

Standard form:

- $4x^3 - 6x^5 + 2x^2 - 1$        $-6x^5 + 4x^3 + 2x^2 - 1$
- D: 5<sup>th</sup> LC: -6
- $X^2 + x - x^4 + 9$        $-x^4 + x^2 + x + 9$
- D: 4<sup>th</sup> LC: -1
- $X + 4$
- D: 1<sup>st</sup> LC: 1 Binomial

Evaluating Polynomials:

- This just means to plug the value given in for x and find the answer.
- Ex: Evaluate  $f(x) = 2x^4 - 8x^2 + 5x - 7$  when  $x = 3$   
 $2(3)^4 - 8(3)^2 + 5(3) - 7 = \boxed{98}$
- Evaluate  $g(x) = -2x^4 + 6x^3 - 3x + 11$  when  $x = 4$   
 $-2(4)^4 + 6(4)^3 - 3(4) + 11 = \boxed{-129}$
- $t(x) = -x^3 + 3x^2 + 9$  for  $t(4)$   
 $-(4)^3 + 3(4)^2 + 9 = \boxed{-7}$
- $r(x) = 3x^5 - x^4 - 6x + 10$  for  $r(-2)$   
 $3(-2)^5 - (-2)^4 - 6(-2) + 10 = \boxed{-90}$

End Behavior:

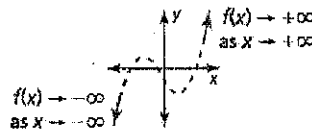
## Core Concept

### READING

The expression " $x \rightarrow +\infty$ " is read as "x approaches positive infinity."

### End Behavior of Polynomial Functions

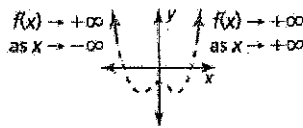
Degree: odd  
Leading coefficient: positive



Degree: odd  
Leading coefficient: negative



Degree: even  
Leading coefficient: positive



Degree: even  
Leading coefficient: negative



Examples:

- Describe the end behavior of the following:

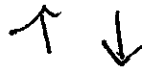
1)  $f(x) = -0.5x^4 + 2.5x^2 + x - 1$

even degree,  
negative LC.



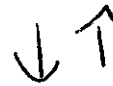
2)  $g(x) = -x^3 + 2x^2 + 9$

odd degree  
negative LC.



3)  $h(x) = -6x - x^4 + 10 + 3x^5$

odd degree  
pos. LC



4)  $b(x) = -x^2 + 0.25x^3 - 1$

odd degree  
pos. LC

