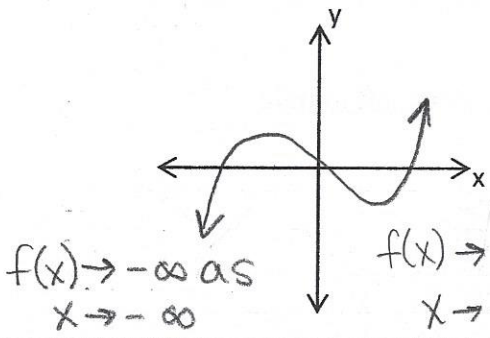
Section 5.2B – End Behavior

The end behavior of a function's graph is the behavior of the graph as x approaches positive infinity $+\infty$ or negative infinity $-\infty$. For the graph of a polynomial function, the end behavior is determined by the function's degree and the sign of it leading coefficient

Definition:

End Behavior of Polynomial Functions

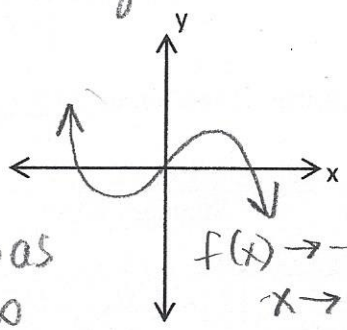
Degree: ODD
Leading Coefficient: Positive



$f(x) \to -\infty$ as $x \to -\infty$

$f(x) \to +\infty$ as $x \to +\infty$

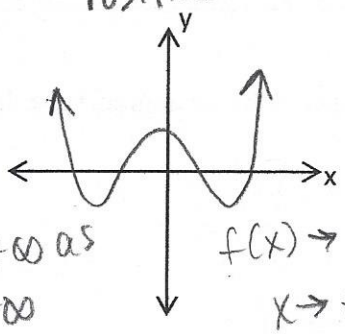
Degree: ODD
Leading Coefficient: Negative



$f(x) \to +\infty$ as $x \to -\infty$

$f(x) \to -\infty$ as $x \to +\infty$

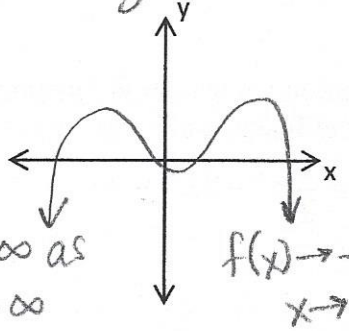
Degree: Even
Leading Coefficient: Positive



$f(x) \to +\infty$ as $x \to -\infty$

$f(x) \to +\infty$ as $x \to +\infty$

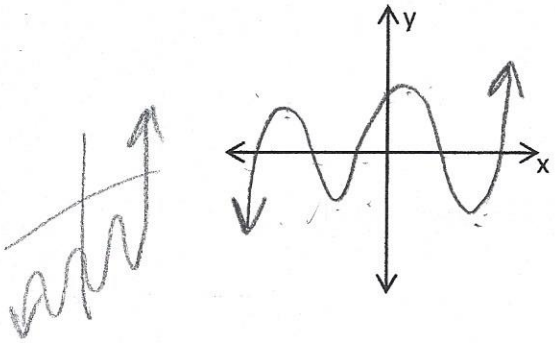
Degree: Even
Leading Coefficient: Negative



$f(x) \to -\infty$ as $x \to -\infty$

$f(x) \to -\infty$ as $x \to +\infty$

Example 1.) Describe the degree and leading coefficient of the polynomial function whose graph is shown.



Degree odd
- LC Positive
- Degree: 5
- Zeros: 5

zeros

* Degree is # of turns + 1

* Zeros are where it crosses x axis

Example 2.) Describe the end behavior of the graph of the polynomial function.

a.) $f(x) = 5x^3 + 3x^2 - x + 7$

$f(x) \to -\infty$ as $x \to -\infty$, $f(x) \to +\infty$ as $x \to +\infty$

b.) $g(x) = -2x^4 - x^3 + 4x - 5$

$f(x) \to -\infty$ as $x \to -\infty$

$f(x) \to -\infty$ as $x \to +\infty$

Section 5.2– Evaluating and Graphing Polynomial Functions

Definitions:

Polynomial – is a monomial or a sum of monomials

Polynomial function: $f(x) = ax^n + bx^{n-1} + cx^{n-2} + ... + dx + e$

* No negative exp or variables in denominator
* Must be in one variable

Note: must have exponents as real #s and coefficients as real #s

Standard form - if written in descending order of exponents from left to right

Degree tells you what type it is!!

Degree:	Type:	Standard Form:	Example:
0	Constant	$f(x) = a_0$	$f(x) = 14$
1	Linear	$f(x) = a_1x + a_0$	$f(x) = 5x - 7$
2	Quadratic	$f(x) = a_2x^2 + a_1x + a_0$	$f(x) = 2x^2 + x - 9$
3	Cubic		$f(x) = x^3 - x^2 + 3x + 1$
4	Quartic		$f(x) = x^4 + 5x^3 - 12x^2 + 2x - 5$

5 Quintic

7 Septic

Ex. 1) Is the equation a polynomial function? If so, write it in standard form, state its degree, type, leading coefficient, and constant term.

a.) $f(x) = \frac{1}{2}x^2 - 3x^4 - 7$

- Yes
- $f(x) = -3x^4 + \frac{1}{2}x^2 - 7$
- Degree: 4, Quartic

  LC: -3, Constant: -7

b.) $f(x) = x^3 + 3^x$

Not a function

c.) $f(x) = 6x^2 + 2x^{-1} + x$

Not a function

d.) $f(x) = -0.5x + \pi x^2 - \sqrt{2}$

- Yes
- $f(x) = \pi x^2 - .5x - \sqrt{2}$
- Degree: 2, Quadratic

  LC: π, Constant: $-\sqrt{2}$