SM 3H DATE: 8/29/23 SECTION: 1.4

OBJECTIVE: I can determine the number of zeros of a polynomial, if a binomial is a factor, and end behavior of a polynomial.

Degree of a polynomial: highest exponent

Fundamental Theorem of Algebra:

the degree of a poly tells you how many zeros (solutions for x) for given poly

EXAMPLE

Without graphing, determine the number of zeros for each of the following polynomials.

$$7x^3 + 9x^5 - 14x^7 + 2x - 3x^2 + 1$$

Standard Form of a Polynomial: highest exp to lowest

Write the polynomial from the example above in standard form.

$-14x^7 + 9x^5 + 7x^3 - 3x^2 + 2x + 1$

7 zeros

Remainder Theorem:

use zero, plug in for x & evaluate

if ans is 0 then it is a factor

For the given polynomials determine which of the binomials listed are factors. Use the remainder theorem. Show work!

1. $f(x) = x^3 + 3x^2 - 4x - 12$

factor

a. $x + 2$ $x = -2$ $(-2)^3 + 3(-2)^2 - 4(-2) - 12 = 0$

b. $x - 2$ $(2)^3 + 3(2)^2 - 4(2) - 12 = 0$

c. $x + 1$ $(-1)^3 + 3(-1)^2 - 4(-1) - 12 = -6$

For the given polynomials determine which of the given values are solutions. Use the remainder theorem. Show work!

1. $f(x) = 2x^3 + 4x^2 + 5x - 8$

zeros

a. $x = 2$ $2(2)^3 + 4(2)^2 + 5(2) - 8 = 34$

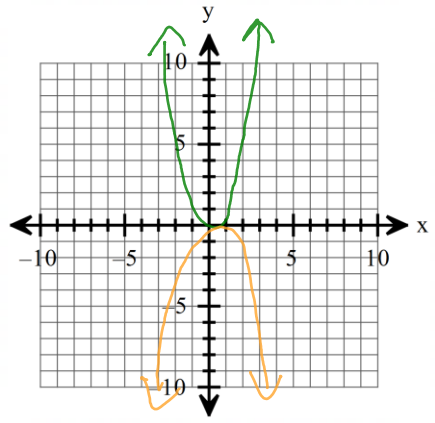
b. $x = -2$

c. $x = 1$

End Behavior: what number function approaches on each end

Limit Notation: $\lim_{x \to \infty} f(x) =$ $\lim_{x \to -\infty} f(x) =$

General example for any even degree polynomial



if poly has a even degree & poly is pos

$\lim_{x \to \infty} f(x) = \infty$

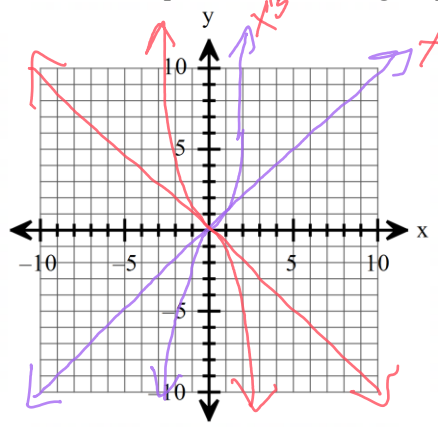
$\lim_{x \to -\infty} f(x) = \infty$

if poly has even degree & poly is neg

$\lim_{x \to \infty} f(x) = -\infty$

$\lim_{x \to -\infty} f(x) = -\infty$

General example for any odd degree polynomial



if poly has odd degree & poly is pos

$\lim_{x \to \infty} f(x) = \infty$

$\lim_{x \to -\infty} f(x) = -\infty$

if poly has odd degree & poly is neg

$\lim_{x \to \infty} f(x) = -\infty$

$\lim_{x \to -\infty} f(x) = \infty$

EXAMPLES

Without graphing, state the degree of the polynomial and determine whether it is even or odd, then write the end behavior as a limit.

1. $f(x) = x^3 - 4x^2 + x - 7$ odd pos

$\lim_{x \to -\infty} f(x) = -\infty$

$\lim_{x \to \infty} f(x) = \infty$

2. $f(x) = -3x^4 + 7x^3 - 4x^2 + x - 1$ even, neg

$\lim_{x \to -\infty} f(x) = -\infty$

$\lim_{x \to \infty} f(x) = -\infty$

*** even goes to heaven but bad goes to h...

Odd are at odd but bad odd is at odd twice

pos/neg

pos/neg

x/y