2.4 Real Zeros of Polynomial Functions

Divide Using Long Division

1.)
$$(6x^3 - 19x^2 + 16x - 4) \div (x - 2)$$

Nov 3-12:13 PM

Divide Using Long Division

Divide Using Long Division

3.)
$$(2x^{4} + 4x^{3} - 5x^{2} + 3x - 2) \div (x^{2} + 2x - 3)$$

$$2 \times + 2x - 3 = 2 \times 4 + 4 \times 3 - 5 \times 2 + 3 \times - 2 - 2 \times 4 + 4 \times 3 - 6 \times 2 - 2 \times 4 + 4 \times 3 - 6 \times 2 - 2 \times 4 + 2 \times - 3 = 2 \times 4 \times - 2 \times$$

Nov 3-12:17 PM

Divide Using Synthetic Division

The Remainder Theorem

If a polynomial f(x) is divided by x-k , the remainder is r=f(k)

Use The Remainder Factor Theorem to evaluate the following function at x = -2

See The Remainder Factor Theorem to evaluate the following function at
$$x = -2$$

5.) $f(x) = 3x^3 + 8x^2 + 5x - 7$
 $f(-2) = 3(-2)^3 + 8(-2)^2 + 5(-2) - 7$
 $= -24 + 32 - 10 - 7$
 $= -9$

Nov 3-12:29 PM

Use The Remainder Theorem to evaluate the following function at x = -3

The Factor Theorem

A polynomial f(x) has a factor (x-k) if and only if f(k)=0

Show that (x-2) and (x+3) are factors and find the remaining factors.

Show that
$$(x-2)$$
 and $(x+3)$ are factors and find the remaining factors.
7.) $f(x) = 2x^4 + 7x^3 - 4x^2 - 27x - 18$

$$2 \quad 7 \quad -4 \quad -2 \quad 7 \quad -18$$

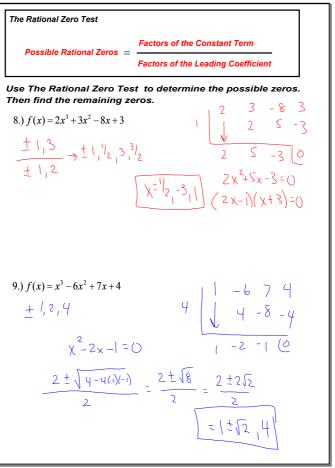
$$2 \quad 4 \quad 22 \quad 36 \quad 18 \quad (2x+3)(x+1) = 0$$

$$2 \quad 11 \quad 18 \quad 9 \quad 0 \quad x = -3 \quad -1, 2, -3$$

$$-6 \quad -15 \quad -9$$

$$2 \quad 5 \quad 3 \quad 0$$

Nov 3-12:58 PM



Nov 3-1:07 PM

Upper and Lower Bound Tests for Real Zeros

Let f be a polynomial function of degree $n \ge 1$ with a positive leading coefficient. Suppose f(x) is divided by x - k using synthetic division.

- If k ≥ 0 and every number in the last line is nonnegative (positive or zero), then k is an upper bound for the real zeros of f.
- If k ≤ 0 and the numbers in the last line are alternately nonnegative and nonpositive, then k is a lower bound for the real zeros of f.

$$f(x) = 2x^4 - 7x^3 - 8x^2 + 14x + 8$$





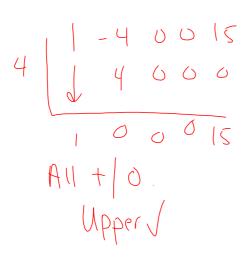
Nov 3-1:32 PM

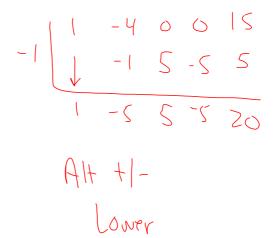
Use synthetic division to verify the upper and lower bounds of the real zeros of the function.

10.)
$$f(x) = x^4 - 4x^3 + 15$$

Upper bound: x = 4

Lower bound: x = -1





11.) Find the polynomial function with leading coefficient 2 that has a degree of 3 with -2, 1, and 4 as zeros.
Nov 3-1:42 PM