PC- Lesson 2.3

Long division and **synthetic division** produce the same results, but synthetic division is MUCH easier. So why learn looooong division? Synthetic division is not always possible! So let's review both...

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

Long Division

Synthetic Division

FACTOR THM: If r = 0, then the divisor & the quotient are FACTORS of p(x).

EX2: $(x^3 - 1) \div (x - 1)$

$(x^3 - 1) \div (x + 1)$

Long Division

Synthetic Division

FACTOR THM: **If r = 0, then the divisor & the quotient are FACTORS of p(x).**

EX2: $(2x^4 + 4x^3 - 5x^2 + 3x - 2) \div (x^2 + 2x - 3)$

Long Division

Synthetic Division

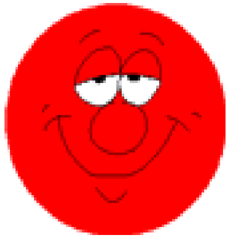
The Remainder Theorem: If p(x) is divided by x - k, the remainder will be the same as p(k). That is p(k) = r

$\frac{p(x)}{x - k}$ = q(x) with remainder of r. Also, p(k) = r

The Factor Theorem: x - k is a factor of p(x) iff p(k) = 0

The Rational Zero Theorem: If p(x) has integer coefficients, every rational zero has the form p/q where p is a factor of the constant term and q is a factor of the leading coefficient.

We will use these theorems to find all zeros of a function!



Let $p(x) = 2x^3 + 3x^2 - 8x + 3$

(a) List all the factors (+ and -) of the constant term (p)
(b) List all the factors (+ and -) of the leading coefficient. (q)
(c) Divide each p by each q.
(d) Make a list of all p/q's

These are the possible rational zeros of p(x)

$\frac{p}{q} =$

Let $p(x) = -3x^3 + 20x^2 - 36x + 16$

Find the possible rational zeros and use them to find the exact zeros of the function.

Find all real solutions: $f(x) = x^4 - x^3 - 29x^2 - x - 30$

Let $p(x) = 10x^3 - 15x^2 - 16x + 12$. Find all zeros of $p(x)$.

#1.