Name: Key

NC Math 3 Unit: 2 Day: 3

Objective: Divide Polynomials using Synthetic Division and explore the Remainder Theorem.

Foundation:

1) Use long division to divide:

$(2x^2 - 17x - 38) \div (2x+3)$ $\boxed{x - 10 - \frac{8}{2x+3}}$

$$
\begin{array}{r}
x - 10 \\
2x+3 \,\big)\, 2x^2 - 17x - 38 \\
-(2x^2 + 3x) \downarrow \\
-20x - 38 \\
-(+20x + 30) \\
-8
\end{array}
$$

2) Use your calculator to evaluate P(-3/2) for the function P(x) = 2x² - 17x - 38.

P(-3/2) = $\boxed{-8}$

Notes:

Steps to Synthetic Division:

1. Make sure the polynomial is in standard form.
2. Plug 0 place holders in for any missing terms.
3. Set the binomial equal to zero, solve, and put that number outside (left) of the synthetic box.
4. Divide using synthetic methods (see examples).
5. Rewrite the ending numbers as a Polynomial starting from right to left: Remainder at the end, loose number, x-term, x^2-term, and so on.

Determine whether a binomial is a factor of the polynomial:

Run through Synthetic division. If the remainder is 0, it is a factor of the polynomial. If the remainder is not 0, it is not a factor of the polynomial.

Remainder Theorem:

Set the binomial equal to zero, plug that number in for every x, and the output you get is the remainder.

Examples:

Use Synthetic division to divide the polynomials.

1. $(x^3 + 3x^2 - x - 3) \div (x-1)$ $\boxed{x^2 + 4x + 3}$

1	1	3	-1	-3
	↓	3	4	3
	1	4	3	0

2. $(x^3 + 27) \div (x+3)$ $\boxed{x^2 - 3x + 9}$

-3	1	0	0	27
	↓	-3	9	-27
	1	-3	9	0

3. Use Synthetic and then **factor** to find the remaining factors.

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

3	4	-12	-1	3
	↓	12	0	-3
	4	0	-1	0

$4x^2 - 1 = \boxed{(2x+1)(2x-1)}$

4. Are the following binomials factors of $(x^3 + 4x^2 + x - 6)$?

$x+1 = 0$

-1 NO

rem = -4

$x+3 = 0$

-3 YES

rem = 0

Explain the connection between questions 1 and 2 from the foundations section of today's notes. (Hint: discuss Remainder Theorem!)

If you set the binomial = 0 and plug in for every x, your output is the remainder.

-1	1	2	3	K
	↓	-1	-1	-2
	1	1	2	2

K - 2 = 2

$\boxed{K = 4}$