Name: ______________________________ Per: _____

Polynomial Division - Synthetic

There are two ways to divide polynomials: **synthetic division** and **long division**. **Synthetic division** is like a puzzle and, once mastered, tends to be easier to use than long division. However, you can only use it if you're dividing by $(x + a)$ binomials. Meaning, the power of *x* must be 1, and the coefficient attached to *x* must also be 1. Also, make sure that you have *every x term*. If there are any missing *x* powers, you have to write in a 0 as a placeholder.

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

This polynomial is missing the x^2 *term, so it's actually:* $(4x^3 + 0x^2 + 5x - 3) \div (x + 2)$

The problem looks like:

Setup:	Step 1:	Step 2:	...repeat Step 1:
$(x+2)=0$, $x=-2$ $4x^3 + 0x^2 + 5x - 3$ -2 | 4 0 5 -3 #1. add down 4	-2 4 0 5 -3 #1. add down 4	-2 | 4 0 5 -3 #2. multiply across -8 equals 4	-2 | 4 0 5 -3 -8 add down 4 -8

...repeat Step 2:			*Now, we need the x's...*
-2 | 4 0 5 -3 multiply across -8 16 equals 4 -8	*Add down, multiply and add down until you have completed the puzzle.*	-2 | 4 0 5 -3 -8 16 -42 4 -8 21 |-45	-2 | 4 0 5 -3 -8 16 -42 4 -8 21 |-45 x^2 x^1 # R

Put the remainder over the ***divisor*** $(x + 2)$*, insert the x's, and you have your answer...*

$$4x^2 - 8x + 21 - \frac{45}{x + 2}$$

1. $(x^3 + 5x^2 - 8x + 4) \div (x - 4)$
Setup:
+4 | 1 5 -8 4

2. $(8x^4 + 20x^3 - 11x^2 + x + 8) \div (x + 3)$
Setup:

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

4. $(2x^4 - 12x^3 - 21x^2 + 8x - 20) \div (x - 7)$

5. *Watch out for missing terms!*
$(7x^4 + 9x^3 + 4x + 5) \div (x + 1)$

6. *Watch out for missing terms!*
$(-3x^5 + 10x^4 + 22x^3 + 15x^2 + 2x) \div (x - 5)$

7. $(2x^5 - 9x^4 - 20x^3 + 10x^2 + 5x + 6) \div (x - 6)$

8. $(4x^3 - 12x^2 - 50x + 7) \div (x - 8)$

9. $(-10x^2 - 7x + 2) \div \left(x + \frac{1}{5}\right)$

10. $(6x^3 + 11x^2 + 3x + 8) \div \left(x - \frac{1}{2}\right)$