Polynomial Synthetic Division

Synthetic Division can be used to factor or divide polynomials when the _____ is a _____ (x – k).

A **Divide:** $5x^3 + 17x^2 + 7x + 3$ **by (x+3)**	**STEPS:** *in your own words*
$(x + 3) = (x – (-3))$	①
-3 ⎦ 5 17 7 3	②

-3 ⎦   5   17   7   3
       ↓   - 15
       5
	③

-3 ⎦   5   17   7   3
       - 15   - 6
       5   2
	④

-3 ⎦   5   17   7   3
       - 15   - 6   - 3
       5   2   1
	⑤

-3 ⎦   5   17   7   3
       - 15   - 6   - 3
       5   2   1   ⎣0
	⑥

-3 ⎦   5   17   7   3
       - 15   - 6   - 3
       5   2   1   ⎣0
       ↓   ↓   ↓   ↓
    $5x^2 + 2x + 1$ R0
	⑦
	 Write the quotient. Begin writing the quotient with a power of x that is one less than the greatest power of x in the dividend. The last number represents the remainder.

$(5x^3 + 17x^2 + 7x + 3) \div (x + 3) =$	

B Divide: $(-10x^3 + 83x^2 - 26x + 6) \div (x - 8)$

Quotient:		Remainder:	

Quotient Notations with Remainders

Remainder Notation	$(-10x^2 + 3x - 2),\ R\ -10$
Polynomial Notation	$\left(-10x^2 + 3x - 2 - \dfrac{10}{x-8}\right)$ ⟵ Remainder ⟵ Divisor

C $(6x^3 + 12x^2 + 9) \div (x + 2)$ **Missing a term**	**D** $(6x^3 - 15x^2 + 60x - 22) \div (2x - 1)$ **Divisor not in form (x – k)**
$\underline{-2|}\quad 6 \quad\quad 12 \quad\quad 0 \quad\quad 9$	$\dfrac{1}{2}\bigg|\quad 6 \quad\quad -15 \quad\quad 60 \quad\quad -22$

Remember the following when dividing polynomials using synthetic division:

① Polynomials must be in _____ form (decreasing degree).

② All terms must be included, so if you have an x^4, then you must have an x^3. If there isn't an x^3 term, write ___ for the missing term.

③ Repeat the process of multiply and add until you determine the remainder.

④ Write the quotient with a power of x that is ___ less than the greatest power of x in the dividend.

⑤ The last number represents the remainder. If the remainder is 0, then the divisor is a _____ of the dividend.