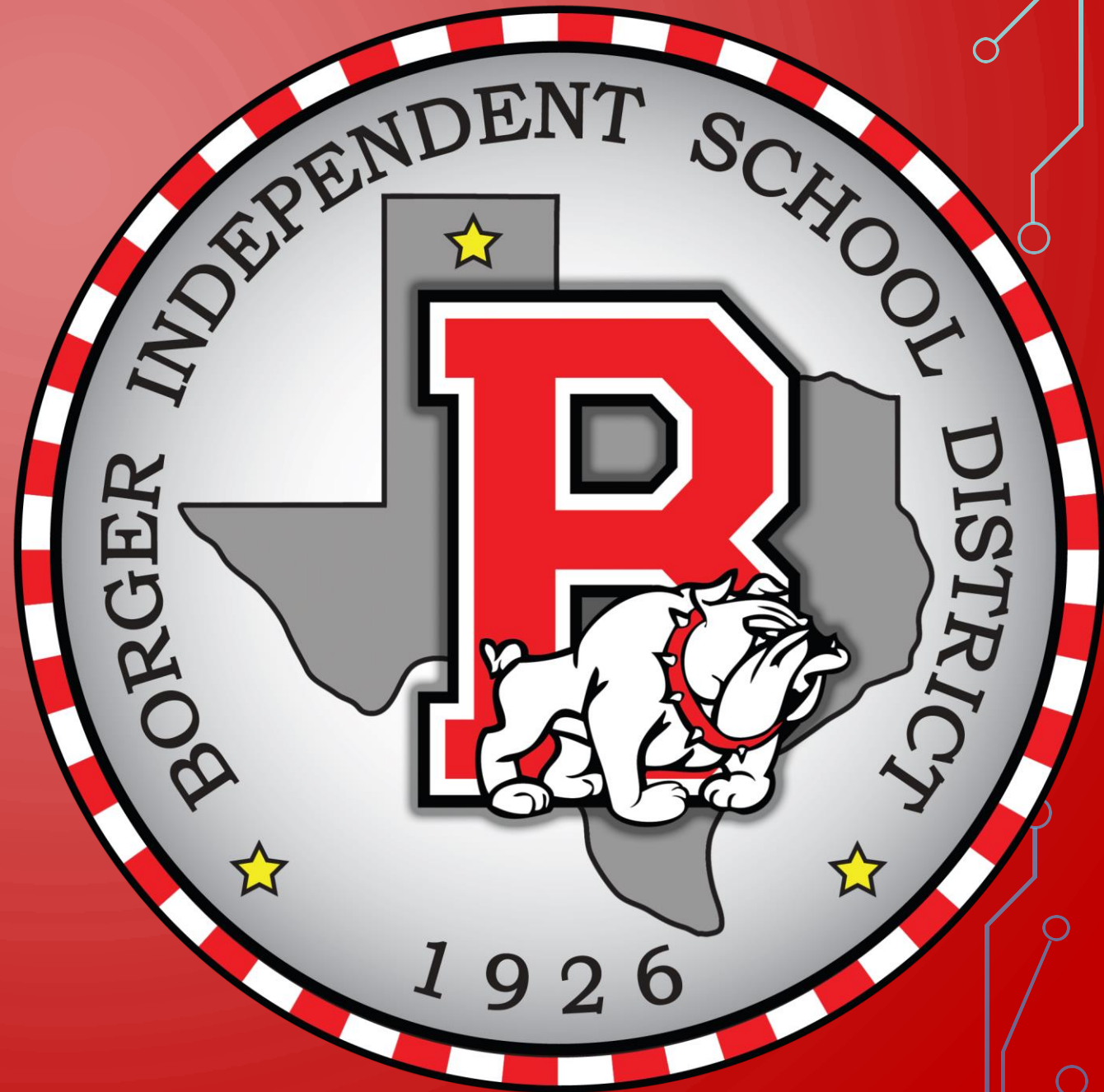# BOARD NOTES

5 NOVEMBER 2019

2A.7 (B) add, subtract, and multiply polynomials;
2A.7 (C) determine the quotient of a polynomial of degree three and of degree four when divided by a polynomial of degree one and of degree two;
2A.7 (D) determine the linear factors of a polynomial function of degree three and of degree four using algebraic methods;
2A.7 (E) determine linear and quadratic factors of a polynomial expression of degree three and of degree four, including factoring the sum and difference of two cubes and factoring by grouping;
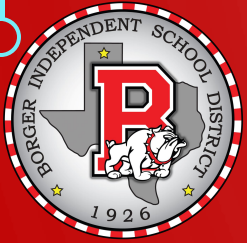
We will be able to determine the factors of special binomial and trinomial polynomials.
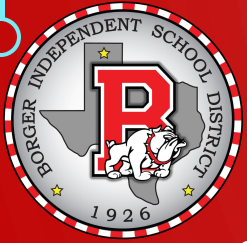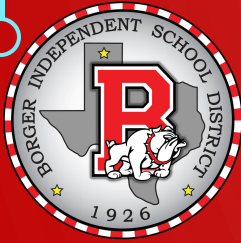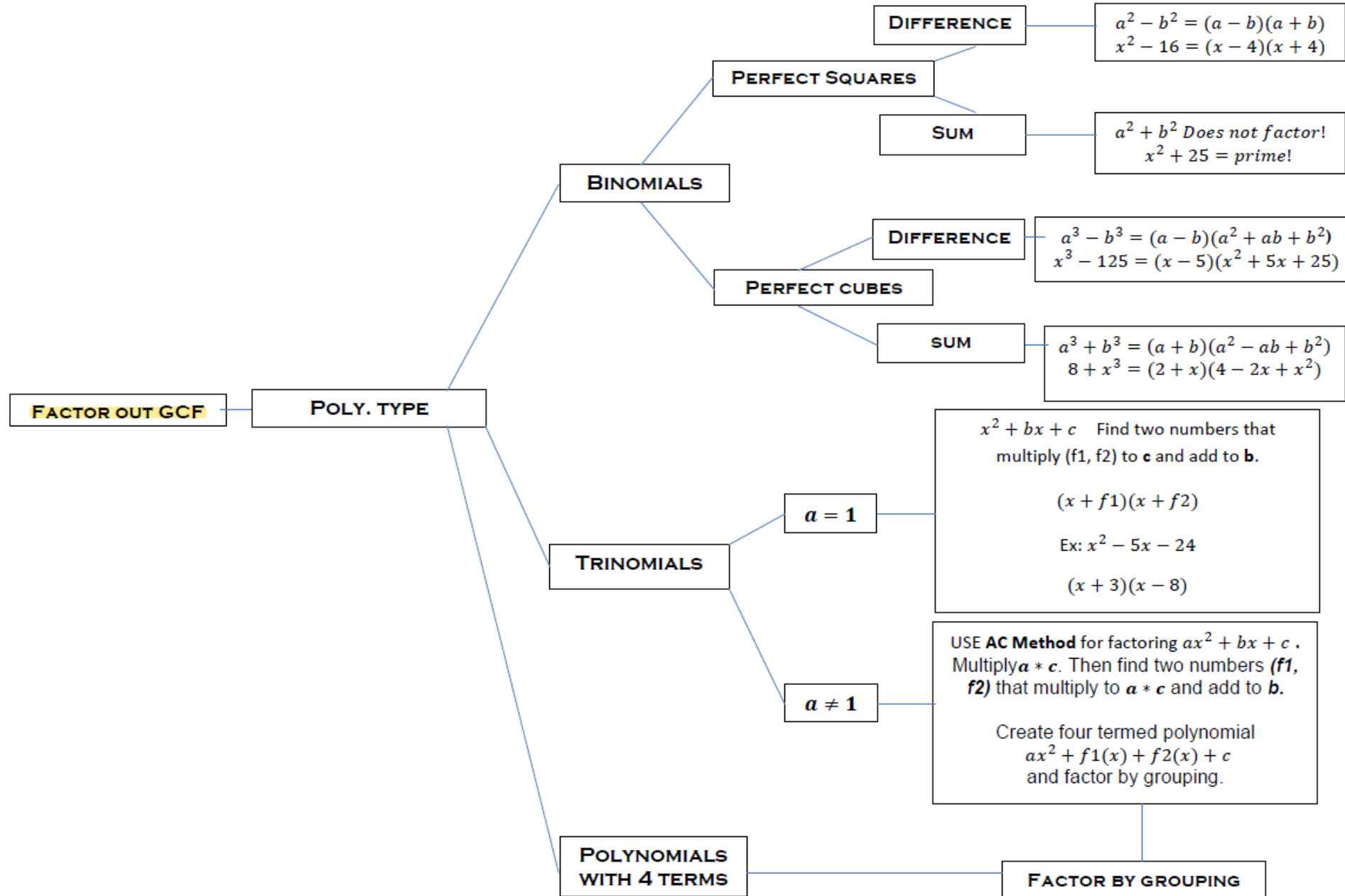
WHAT WE NEED:

- Definition of polynomial

- Laws of Exponents

- Addition and Subtraction of Polys

- Multiplication of Polys

- Division of Polys

I WILL BE ABLE TO COMPLETE MY HOMEWORK GIVEN THE

- Polynomial

FACTORING POLYNOMIALS FLOW CHART

FACTOR OUT GCF — **POLY. TYPE**

BINOMIALS

PERFECT SQUARES

DIFFERENCE
$$a^2 - b^2 = (a - b)(a + b)$$
$$x^2 - 16 = (x - 4)(x + 4)$$

SUM
$$a^2 + b^2 \; Does \; not \; factor!$$
$$x^2 + 25 = prime!$$

PERFECT CUBES

DIFFERENCE
$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$
$$x^3 - 125 = (x - 5)(x^2 + 5x + 25)$$

SUM
$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$
$$8 + x^3 = (2 + x)(4 - 2x + x^2)$$

TRINOMIALS

$a = 1$

$x^2 + bx + c$ Find two numbers that multiply (f1, f2) to **c** and add to **b**.

$$(x + f1)(x + f2)$$

Ex: $x^2 - 5x - 24$

$$(x + 3)(x - 8)$$

$a \neq 1$

USE **AC Method** for factoring $ax^2 + bx + c$. Multiply $a * c$. Then find two numbers **(f1, f2)** that multiply to $a * c$ and add to **b**.

Create four termed polynomial
$$ax^2 + f1(x) + f2(x) + c$$
and factor by grouping.

POLYNOMIALS WITH 4 TERMS

FACTOR BY GROUPING

Factoring Polynomials

Factoring a polynomial expressed as the sum of monomials means finding an equivalent expression that is a product. The goal in factoring a polynomial is to use one or more factoring techniques until each of the polynomial's factors, except possibly for a monomial factor, is prime or irreducible. In this situation, the polynomial is said to be **factored completely**.
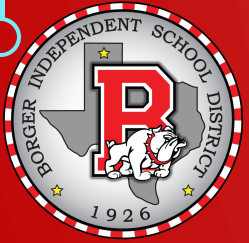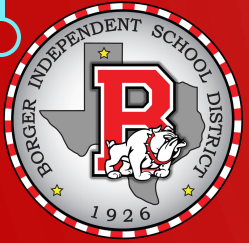
The Difference of Two Squares

If A and B are real numbers, variables, or algebraic expressions, then

$$A^2 - B^2 = (A + B)(A - B).$$

In words: The difference of the squares of two terms factors as the product of a sum and a difference of those terms.
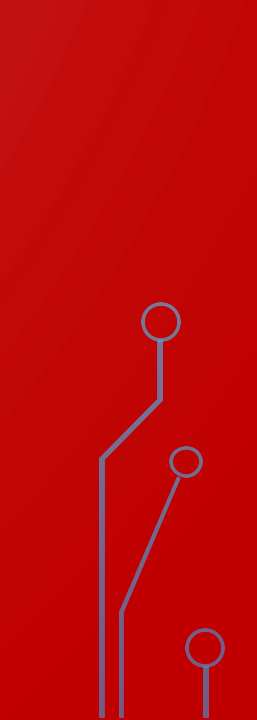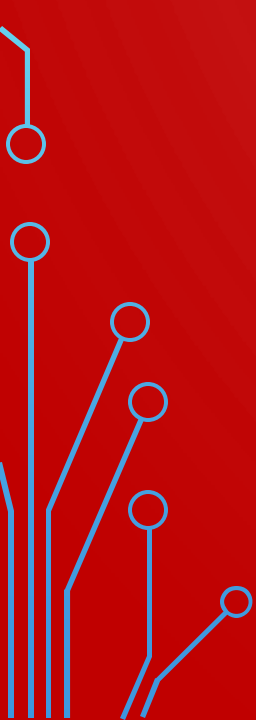
Factoring Perfect Square Trinomials

Let A and B be real numbers, variables, or algebraic expressions.

1. $A^2 + 2AB + B^2 = (A+B)^2$

2. $A^2 - 2AB + B^2 = (A-B)^2$

$$x^2 - 9 = (x-3)(x+3)$$

A = x 😊

B = 3

$$4x^2 - y^2 = (2x-y)(2x+y)$$

A = 2x 😊

B = y

$$25x^2 - 49y^2 = (5x + 7y)(5x - 7y)$$

$$x^2 + 9 = (x - 3i)(x + 3i)$$

$$125x^2 - 80 = 5(25x^2 - 16)$$
$$= 5(5x - 4)(5x + 4)$$

$$x^2 + 12x + 36 = (x+6)^2$$

$A = x$

$B = 6$

$2AB = 2 \cdot x \cdot 6$

$\quad = 12x$

$$9x^2 + \boxed{24x} + 16 = (3x+4)^2$$

$A = 3x$

$B = 4$

$2AB = 2 \cdot 3x \cdot 4$

$\quad = 24x$

$$(3x+4)(3x+4) = 9x^2 + 12x + 12x + 16$$
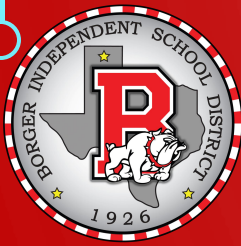
$$= 9x^2 + 24x + 16$$

$$x^2 + 9x = x(x+9)$$

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

$A = x$

$B = 1$

$2AB = 2 \cdot x \cdot 1$

$\quad = 2x$

$$x^2 - 4x + 4 = (x-2)^2$$

$$4x^4 - \boxed{20x^2} + 25 = (2x^2 - 5)^2$$

$$A = 2x^2$$

$$B = 5$$

$$2AB = 2 \cdot 2x^2 \cdot 5$$

$$= 20x^2$$

$$3x^3 - 6x^2 + 3x = 3x(x-1)^2$$