BOARD NOTES

11 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 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. → **Factor by grouping**
  - **Polynomials with 4 terms** → **Factor by grouping**

A Strategy for Factoring $ax^2 + bx + c$

Assume, for the moment, that there is no greatest common factor.

1. Find two **F**irst terms whose product is ax^2:

$$(\square x + \quad)(\square x + \quad) = ax^2 + bx + c.$$

2. Find two **L**ast terms whose product is c:

$$(\square x + \square)(\square x + \square) = ax^2 + bx + c.$$

3. By trial and error, perform steps 1 and 2 until the sum of the **O**utside product and **I**nside product is bx:

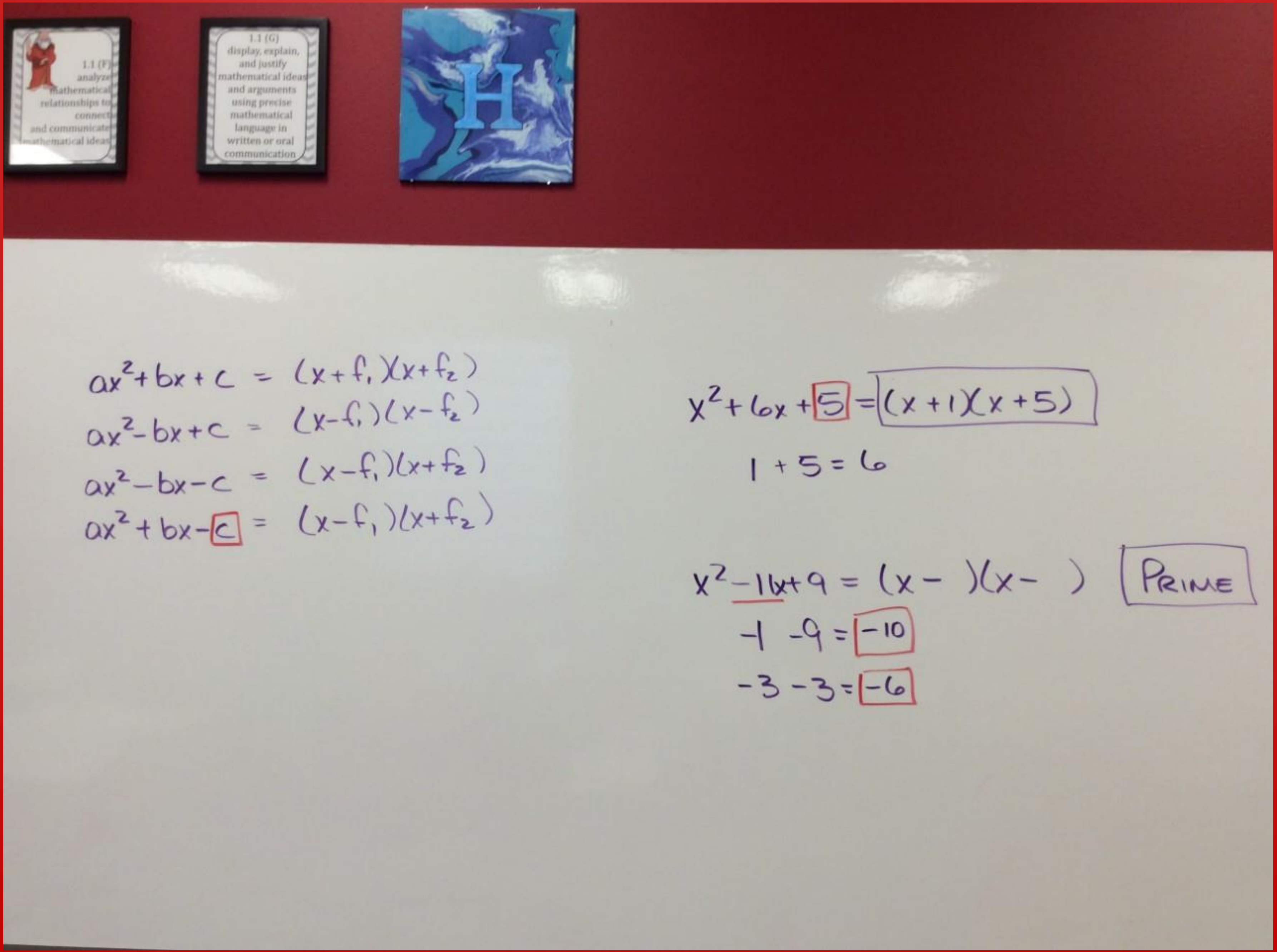
$$(\square x + \square)(\square x + \square) = ax^2 + bx + c.$$

I

O

Sum of O + I

If no such combination exists, the polynomial is prime.



1.1 (F) analyze mathematical relationships to connect and communicate mathematical ideas
1.1 (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication
H
$ax^2+bx+c = (x+f_1)(x+f_2)$
$ax^2-bx+c = (x-f_1)(x-f_2)$
$ax^2-bx-c = (x-f_1)(x+f_2)$
$ax^2+bx-\boxed{c} = (x-f_1)(x+f_2)$
$x^2+6x+\boxed{5} = \boxed{(x+1)(x+5)}$
$1+5=6$
$x^2-16x+9 = (x-\ )(x-\ )$
PRIME
$-1\ -9 = \boxed{-10}$
$-3\ -3 = \boxed{-6}$

$x^2-6x-27 = \boxed{(x-9)(x+3)}$

$-1 \quad 27 = 26$

$1 \quad -27 = -26$

$9 \quad -3 = 6$

$-9 \quad 3 = \boxed{-6}$

$(x-9)(x+3)$

$x^2+3x-9x-27$

$x^2-6x-27$

$x^2+2x-15 = \boxed{(x-3)(x+5)}$

$-1 \quad 15 = 14$

$-3 \quad 5 = 2$

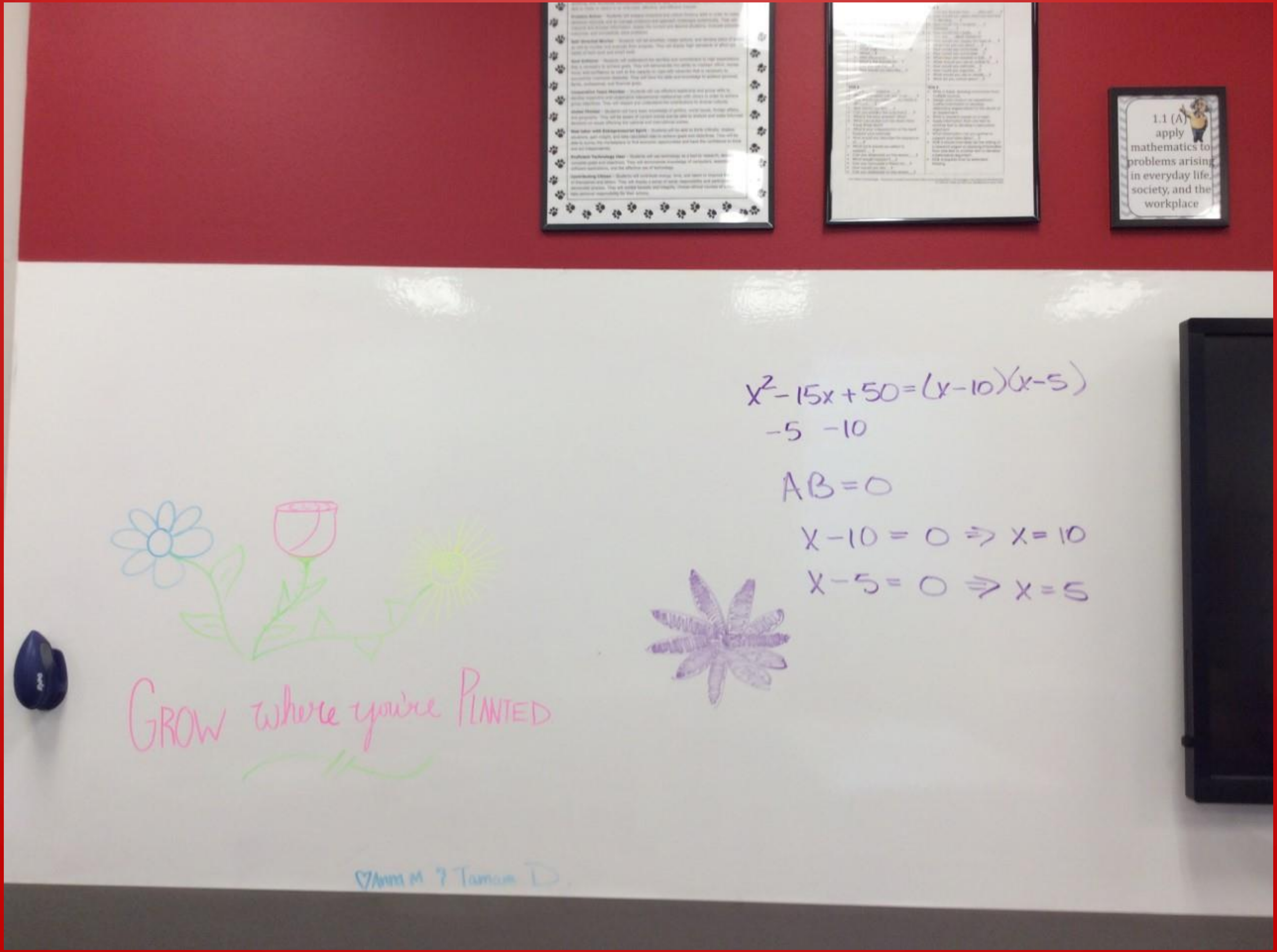
$x^2-6x+24$ $\boxed{\text{PRIME}}$

$-1 \quad -24 \quad -25$

$-2 \quad -12 \quad -14$

$-3 \quad -8 \quad -11$

$-4 \quad -6 \quad -10$



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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**.

Greatest Common Factor

The **greatest common factor**, abbreviated GCF, is an expression of the highest degree that divides each term of the polynomial.

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

Factoring the Sum or Difference of Two Cubes

1. Factoring the Sum of Two Cubes

$$A^3 + B^3 = (A + B)(A^2 - AB + B^2)$$

2. Factoring the Difference of Two Cubes

$$A^3 - B^3 = (A - B)(A^2 + AB + B^2)$$