Factoring Polynomials

Factoring

Factoring a polynomial is the process of writing the polynomial as a product of prime factors. It is the reverse operation of polynomial multiplication.

A polynomial that cannot be factored is called a _____ polynomial.

Greatest Common Factor (GCF)

The Greatest Common Factor of a polynomial is:
- The highest number that will evenly divide all terms
- The lowest power of all shared variables in a polynomial

Examples: Name and factor the GCF from each polynomial:

a. $10y + 45$

b. $x^6 - x^4 + x^3$

c. $15x^3 - 21x^2 + 9x$

d. $14x^7y^2 - 28x^6y^2 + 35x^5y$

e. $4x + 5y - 6z$

Factor by Grouping-

Factor by grouping is used when a polynomial containing _____ terms is to be factored.

To factor by grouping:
- Create two groups of two using parentheses
- Factor the GCF from each group
    - If the first term in the group is negative then the GCF is negative
- If the remaining binomials are the same, factor the common binomial

Examples: Factor by grouping if possible

a. $5x + 15 + xy + 3y$

b. $8w^2 + 7wv + 8w + 7v$

c. $2x^3 - x^2 - 10x + 5$

d. $4y^4 + y^2 + 20y^3 + 5y$

Factoring a Difference of Perfect Squares

The formula for factoring a difference of perfect squares is $a^2 - b^2 =$ _____

Examples: Factor the following completely:

a. $x^2 - 225$ b. $9x^2 - 36y^2$ c. $5x^3y - 125xy$

d. $x^4 - 81$ e. $2x^5y - 16xy$ f. $x^2 + 64$

Factoring Trinomials of the Form $x^2 + bx + c$

To factor a trinomial of the form $x^2 + bx + c$ follow the following steps:

Examples: Factor the following trinomials completely if possible:

a. $x^2 + 6x + 8$ b. $x^2 - 2x - 8$

c. $x^2 + 3x - 70$ d. $x^2 + 4x - 10$

e. $3x^3 + 3x^2 - 126x$

f. $5x^3y - 25x^2y^2 - 120xy^3$

Factoring Trinomials of the Form $ax^2 + bx + c$

To factor a trinomial of the form $ax^2 + bx + c$ follow the following steps:

Examples: Factor the following trinomials completely if possible:

a. $5x^2 + 22x + 8$

b. $36x^2 - 5x - 24$

c. $3x^2 + 20x - 63$

d. $6x^2 - 13xy + 5y^2$

Factoring Perfect Square Trinomials

A **perfect square trinomial** is trinomial that has one of the following two forms:

$a^2 + 2ab + b^2 =$ _____ or $a^2 - 2ab + b^2 =$ _____

Examples: Factor the following trinomials completely if possible:

a. $x^2 + 22x + 121$

b. $x^2y^2 - 10xy + 25$

c. $16x^2 + 40x + 25$

d. $25x^2 - 60xy + 36y^2$