

How can we factor polynomials?

"Factoring" refers to writing something as a product. Factoring completely means that all of the factors are relatively prime (they have a GCF of 1).

Methods:

1. Greatest Common Factor (GCF) - Any polynomial
2. Grouping - Only for 4 or 6 term polynomials
3. Trinomial Method - Only for Trinomials

Method 1: Factoring Out the Greatest Common Factor (GCF)

Factoring out the GCF can be done by using the distributive property.

Ex 1: Factor $2x + 2y$.

Step 1: Find the GCF of $2x$ and $2y$.
The GCF is 2.

Step 2: Rewrite by factoring out the GCF.

$$\boxed{2(x + y)}$$

Step 3: Check by using the distributive property.

$$2(x + y)$$

$$2x + 2y \quad \checkmark$$

Ex 2: Factor $16x^2y - 24y^2z + 40y^2$.

Step 1: Find the GCF. $8y$

Step 2: Factor out the GCF.

$$8y(2x^2 + (-3yz) + 5y)$$

Step 3: Check by using the distributive property.

$$16x^2y + (-24y^2z) + 40y^2 \checkmark$$

Factor each polynomial completely.

Ex 3: $24x^3 - 16x^2 + 18x$

$$2x(12x^2 + (-8x) + 9)$$

Ex 4: $81x^5y - 27x^3y^2 - 144xy^3$

$$9xy(9x^4 + (-3x^2y) + (-16y^2))$$

Ex 5: $16y^3 + 15y^2 - 49$

Prime

Method 2: Factoring by Grouping

Ex 1: $12xy + 20x + 9y + 15$

$$(12xy + 20x) + (9y + 15)$$

Step 1: Group terms together that have a common monomial factor.

$$4x(3y+5) + 3(3y+5)$$

Step 2: Factor out the GCF of each group.

$$(3y+5)(4x+3)$$

Step 3: Find the common polynomial factor and factor it out using the distributive property.

F O I L

$$12xy + 9y + 20x + 15 \checkmark$$

Step 4: Check by multiplying.

Ex 2: $15ab - 3a + 10b - 2$

$$(15ab - 3a) + (10b - 2)$$

$$3a(5b + (-1)) + 2(5b + (-1))$$

$$(5b + (-1))(3a + 2)$$

Check:

F O I L

$$15ab + 10b + (-3a) + (-2) \checkmark$$

Ex 3: $6xy + 8x - 21y - 28$

$$(6xy + 8x) + (-21y + (-28))$$

$$2x(3y+4) + (-7)(3y+4)$$

$$(3y+4)(2x+(-7))$$

F O I L

$$6xy + (-21y) + 8x + (-28) \checkmark$$

$$\text{Ex 4: } \underline{4x^2z^2} - \underline{10x^2} - \underline{6yz} + \underline{8yz^2} - \underline{3x^2z} - \underline{20y}$$

$$(-10x^2 + (-3x^2z) + 4x^2z^2) + (-20y + (-6yz) + 8yz^2)$$

$$x^2(-10 + (-3z) + 4z^2) + 2y(-10 + (-3z) + 4z^2)$$

$$\boxed{(4z^2 + (-3z) + (-10))(x^2 + 2y)}$$

Assignment #52

Part I: Factoring Day 1 and Factoring Day 2

Part II: 9.1/9.2 Practice Worksheet