

Factoring polynomials

Factoring is a backwards (reverse) process of multiplying:

to multiply $5 * 8 = 40$

to factor $40 = 5 * 8 = 20 * 2 = 10 * 4$



Factoring polynomials

In this chapter we discuss:

- (1) factoring **GCF** (Greatest Common Factor)
- (2) factoring a special product: *difference of squares*
- (3) factoring *by grouping*
- (4) factoring *trinomials*

Factoring polynomials : GCF

[Def] Greatest common factor of a polynomial is a factor with the highest degree and the largest numerical coefficient, that is a factor of each term of the polynomial.

Example: let's find GCF of $24mn - 32n$

Factoring polynomials : GCF

Exercise 1: factor each of the polynomials using GCF

(1) $24x^2 - 60x$

(2) $10r^3s^2 + 25r^2s^2 - 15r^2$

Factoring polynomials by grouping

If we have a 4-terms polynomial, we can try the grouping method: group terms into pairs, for each group find and factor the GCF;

if the expressions inside the parentheses are the same, the method worked successfully (we will finish in few steps)

If the expressions inside the parentheses are different, we can try to re-group the terms

If we cannot get the same expressions inside parentheses after factoring, the method didn't work out.



Factoring polynomials by grouping

Example: Let's factor $ab - ac + b^2 - bc$ by grouping

Factoring polynomials by grouping

Exercise 2: what is wrong with the following work?

(1) I want to factor $6r^2 + 12rs - r - 2s$

(2) grouping: $(6r^2 + 12rs) - (r - 2s)$

(3) GCF for the first set of parentheses is $6r$

(4) GCF for the second set of parentheses is 1

(5) factoring the GCFs: $6r(r + 2s) - 1(r - 2s)$

(6) finishing up: $(r + 2s)(6r - 1)$ or $(r - 2s)(6r - 1)$????????

Factoring polynomials by grouping

Exercise 3: factor polynomials by grouping method

(1) $x^2 + 3x + 4xy + 12y$

(2) $m^2 - 6n^3 + 2mn^2 - 3mn$



Factoring special polynomials: difference of squares

Example: let's factor $16a^2 - 25b^4$

Factoring special polynomials: difference of squares

Exercise 4: factor the given polynomials, if possible

(1) $x^2 - 9$

(2) $a^2 b^6 - 25$

(3) $z^2 + 16$