



Extension Part 1

Factoring Polynomials by Grouping

LESSON
7.9

Factoring Polynomials by Grouping

Steps for Factoring by Grouping

1. A polynomial must have 4 terms to factor by grouping.

ex. $x^3 + x^2 + 2x + 2$

2. We factor the first two terms and the second two terms separately. Use the rules for GCF to factor these.

| | | | | |
|------------------------|-------------|--|-----------|--------------|
| The GCF of | $x^3 + x^2$ | | $+2x + 2$ | The GCF of |
| $x^3 + x^2$ is x^2 . | $x^2(x+1)$ | | $+2(x+1)$ | $2x+2$ is 2. |

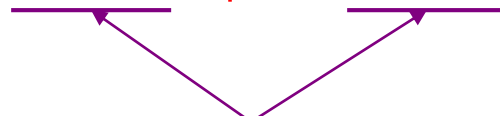
3. Finally, we factor out the "common factor" from both terms. This means we write the $(x+1)$ term in front and the 2 terms left over, x^2+2 , in a separate set of parentheses.

$$(x+1)(x^2 + 2)$$

Examples:

1. $6x^3 - 9x^2 + 4x - 6$

The GCF of $6x^3 - 9x^2$ is $3x^2$. $3x^2(2x-3) \mid +4x-6$
 $3x^2(2x-3) \mid +2(2x-3)$




These two terms must be the same.

The GCF of $4x-6$ is 2.

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

2. $x^3 + x^2 + x + 1$

The GCF of $x^3 + x^2$ is x^2 . $x^2(x+1) \mid +x+1$
 $x^2(x+1) \mid +1(x+1)$



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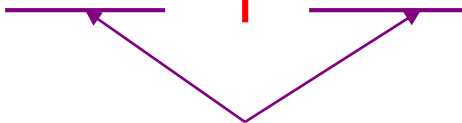
The GCF of $x+1$ is 1.

$$= (x+1)(x^2+1)$$

More Examples:

3. $x^3 + 3x^2 + 2x + 6$

The GCF of $x^3 + 3x^2$ is x^2

$$\begin{array}{l|l} x^3 + 3x^2 & + 2x + 6 \\ x^2(x + 3) & + 2(x + 3) \end{array}$$


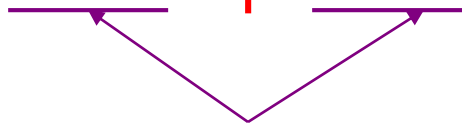
These two terms must be the same.

The GCF of $2x + 6$ is 2

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

4. $x^2y^2 + ay^2 + ab + bx^2$

The GCF of $x^2y^2 + ay^2$ is y^2

$$\begin{array}{l|l} x^2y^2 + ay^2 & + ab + bx^2 \\ y^2(x^2 + a) & + b(x^2 + a) \end{array}$$


These two terms must be the same.

The GCF of $ab + bx^2$ is b

$$= (x^2 + a)(y^2 + b)$$

Try These:

Factor by grouping.

a. $8x^3 + 2x^2 + 12x + 3$

b. $4x^3 - 6x^2 - 6x + 9$

c. $x^3 + x^2 - x - 1$

d. $3a - 6b + 5a^2 - 10ab$

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c. $x^3 + x^2 - x - 1$

c. $(x + 1)(x + 1)(x - 1)$

d. $3a - 6b + 5a^2 - 10ab$

d. $(a - 2b)(3 + 5a)$