2.07 Factoring by Grouping

Basic Algebra: One Step at a Time. Pages 173 -176: 7, 11, 13, 14, 15, 17, 21, 22.

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Guidelines to Factoring

1. Common Factor
2. Trinomials
3. Difference of two squares
4. Grouping

While there are many different types of factoring by grouping, in this introductory level of algebra, the only grouping problems you will have will involve exactly four terms, and in the grouping, you can always group the first two terms and the last two terms. When you group the first two and the last two terms together, you MUST get a common factor! If you don't get a common factor—that is, if the second binomial factor does not match the first binomial factor EXACTLY in this set of exercises, then you must have done it wrong. Go back and find your error!!

p. 175: 7. $ax - bx + ay - by$

SOLUTION: Notice that there are NO common factors, it is NOT a trinomial, and it is NOT the difference of two squares! The only thing left to do is to try a grouping of the first two terms and the last two terms, and hope you get a common factor.

$$ax - bx + ay - by$$
$$x(a-b) + y(a-b)$$

Notice that you DO have a common factor: $(a-b)$, so take out the $(a-b)$.

$$(a-b)(x+y)$$

11. $xy-5x\ -\ 2y+10$

SOLUTION: Notice that there are NO common factors, it is NOT a trinomial, and it is NOT the difference of two squares! The only thing left to do is to try a grouping of the first two terms and the last two terms, and hope you get a common factor.

$xy-5x\ -\ 2y+10$

$x(y-5)\ -\ 2(y-5)$

Notice that you DO have a common factor $(y-5)$, so take out the $(y-5)$.

$(y-5)(x\ -\ 2)$

13. x^3-x^2-9x+9

SOLUTION: Notice that there are NO common factors, it is NOT a trinomial. Group the first two terms and the last two terms, and make sure that you get a common factor!

x^3-x^2-9x+9

$x^2(x-1)\ -\ 9(x-1)$

Notice that you DO have a common factor $(x-1)$, so take out the $(x-1)$.

$(x-1)(x^2\ -\ 9)$

Now, you have a difference of two squares, which factors again!

$(x-1)(x-3)(x+3)$ **Final answer!!**

14. $x^3-5x^2-4x+20$

SOLUTION: Notice that there are NO common factors, it is NOT a trinomial, and it is NOT the difference of two squares! Group the first two terms and the last two terms, and make sure that you get a common factor!

$x^3-5x^2-4x+20$

$x^2(x-5)\ -\ 4(x-5)$

Notice that you DO have a common factor $(x-5)$, so take out the $(x-5)$.

$(x-5)(x^2\ -\ 4)$

Now, you have a difference of two squares, which factors again!

$(x-5)(x-2)(x+2)$ **Final answer!!**

15. x^3+7x^2-x-7

SOLUTION: Notice that there are NO common factors, it is NOT a trinomial, and it is NOT the difference of two squares! Group the first two terms and the last two terms, and make sure that you get a common factor!

$$x^3+7x^2-x-7$$

$$x^2(x+7) \; - \; 1(x+7)$$

Notice that you DO have a common factor $(x+7)$, so take out the $(x+7)$.

$$(x+7)(x^2 \; - \; 1)$$

Now, you have a difference of two squares, which factors again!

$(x+7)(x-1)(x+1)$ **Final answer!!**

17. $x^3+5x^2-25x-125$

SOLUTION: Notice that there are NO common factors, it is NOT a trinomial, and it is NOT the difference of two squares! Group the first two terms and the last two terms, and make sure that you get a common factor!

$$x^3+5x^2-25x-125$$

$$x^2(x+5) \; - \; 25(x+5)$$

Notice that you DO have a common factor $(x+5)$, so take out the $(x+5)$.

$$(x+5)(x^2 \; - \; 25)$$

Now, you have a difference of two squares, which factors again!

$(x+5)(x-5)(x+5)$ **Final answer!!**

21. $x^3-4x^2-9x+36$

SOLUTION: Notice that there are NO common factors, it is NOT a trinomial, and it is NOT the difference of two squares! Group the first two terms and the last two terms, and make sure that you get a common factor!

$x^3-4x^2-9x+36$

$x^2(x-4) - 9(x-4)$

Notice that you DO have a common factor $(x-4)$, so take out the $(x-4)$.

$(x-4)(x^2 - 9)$

Now, you have a difference of two squares, which factors again!

$(x-4)(x-3)(x+3)$ Final answer!!

22. $x^3-9x^2-4x+36$

SOLUTION: Notice that there are NO common factors, it is NOT a trinomial, and it is NOT the difference of two squares! Group the first two terms and the last two terms, and make sure that you get a common factor!

$x^3-9x^2-4x+36$

$x^2(x-9) - 4(x-9)$

Notice that you DO have a common factor $(x-9)$, so take out the $(x-9)$.

$(x-9)(x^2 - 4)$

Now, you have a difference of two squares, which factors again!

$(x-9)(x-2)(x+2)$ Final answer!!