ATM

Kothe

Week 5, 6

Apr 27 – May 8

4.2 LAWS OF EXPONENTS

SOME OF THE LAWS OF EXPONENTS

Product of Powers	**Power of a Product**	**Power of a Power**
$a^m \cdot a^n$	$(ab)^n$	$(a^m)^n$
a^{m+n}	$a^n b^n$	$a^{m \cdot n}$
keep base & add exponents	Distribute the exponent to each factor of the product	keep base & multiply exponents

EX 1 SIMPLIFY

$(-3x^2y^3)(4xy^2)$

$-3\cdot 4x^2xy^3y^2$

$-12x^{2+1}y^{3+2}$

$-12x^3y^5$

$(st^4)^3$

$s^{1\cdot 3}t^{4\cdot 3}$

s^3t^{12}

$(-x^3)^2$

$(-1)^2(x^3)^2$

$x^{3\cdot 2}$

x^6

EX 2 SIMPLIFY

$u\cdot(u^2)^3\cdot u^5$

$u\cdot u^{2\cdot 3}\cdot u^5$

u^{1+6+5}

u^{12}

$(3xy^2z^3)^3$

$3^3x^3y^{2\cdot 3}z^{3\cdot 3}$

$27x^3y^6z^9$

EX 3 SIMPLIFY

$$3t^2\left(t^3-2t^2+t-4\right)$$

$$3t^2\cdot t^3-3t^2\cdot 2t^2+3t^2\cdot t-4\cdot 3t^2$$

$$3t^5-6t^4+3t^3-12t^2$$

EX 4 SIMPLIFY

(ASSUME THAT VARIABLE EXPONENTS REPRESENT POSITIVE INTEGERS.)

$$\left(a^2\right)^k\left(a^k\right)^3$$

$$a^{2k}\cdot a^{3k}$$

$$a^{5k}$$

$$x^{m-n}\left(x^{m+n}+x^n\right)$$

$$x^{m-n+m+n}+x^{m-n+n}$$

$$x^{m+m}+x^m$$

$$x^{2m}+x^m$$

ATM 4.5 & 4.6
Different Factoring Methods

FACTORING

1. Look for a common factor.
2. If there are 2 terms and you have done #1,is it:
   --- A difference of squares
   --- The sum or difference of two cubes.
3. If there are 3 terms and you have done #1, can it be factored as the product of 2 binomials?
4. If there are more than 3 terms, can it be factored by grouping?
5. Has the polynomial been completely factored? Can any of the factors you found be factored again? If so, you must factor these again.

Factoring Out the GCF

1. Find the GCF
2. Divide each term by the GCF
   - Result is the quotient
3. Put in factored form = (GCF)(Quotient)
4. Check your solution
   - Use the distributive property

Example 1

$$15ab^2 - 25abc$$
$$5ab(3b - 5c)$$

Factoring By Grouping

1. Group polynomial into two parts
2. Factor out the GCF from each group

Note: You should have the same polynomial as a factor in both groups--
→New GCF

3. Factor out the New GCF
4. Result: (New GCF)(Quotient)

Example 2

$$6x^2y - x^2 + 6y - 1$$
$$6x^2y - x^2 + 6y - 1$$
$$x^2(6y-1) + 1(6y-1)$$
$$(x^2+1)(6y-1)$$

Factoring Trinomials

$$2x^2+7x+6$$

- Split the middle term/ X method (then grouping)
- Guess & Check/ Trial & Error

Ex3. $2x^2+7x+6$

Perfect Square Trinomials

A trinomial is a PST if meets these criteria.

- The first and last terms are perfect squares (i.e. 4, 9, 16, 25)
- The middle term is two times the square root of the first (a) and last (b) terms

$$a^2 \pm 2ab + b^2 = (a \pm b)(a \pm b) = (a \pm b)^2$$

*Ex.*4

Factor

$$9y^2 + 12y + 4$$

$\sqrt{9y^2} = 3y$ ✓

$\sqrt{4} = 2$ ✓

$2(3 \times 2) = 12$ ✓

$$(3y + 2)^2$$

Difference of Two Squares

A binomial is a Difference of squares if meets these criteria.

- The first and last terms are perfect squares (i.e. 4, 9, 16, 25)
- The first and last terms have opposite signs (one is positive, one is negative)

$$(a^2 - b^2) = (a+b)(a-b)$$

Note: The SUM of two squares WILL NOT factor this way.

Ex.5
Factor

$$16x^2 - 169y^2$$

$\sqrt{16x^2} = 4x$ ✓

$\sqrt{169y^2} = 13y$ ✓

$$(a+b)(a-b)$$

$$(4x+13y)(4x-13y)$$

*Ex.*6
Factor

$$5x^3+15x^2-5x-15$$

$$5x^3+15x^2-5x-15$$
$$5x^2(x+3)-5(x+3)$$
$$(5x^2-5)(x+3)$$
$$5(x^2-1)(x+3)$$
$$5(x+1)(x-1)(x+3)$$

Sums and Differences of Cubes

a^3+b^3 or a^3-b^3

$(a+b)(a^2-ab+b^2)$ $(a-b)(a^2+ab+b^2)$

SOFA

SOFA

Same Opposite of the First Always+

Ex 7

Factor x^3y^3+8

Ex 8

Factor $64x^6-y^6$

Ex 9

Factor: Hint, remember you might have to pull out a GCF first to make them perfect cubes.

$$24x - 81x^4$$

Solving Equations using Factoring

- Set the equation equal to zero
- Factor
- Set each factor equal to zero
- Solve each case
- Check

$$2x^2 + 7x + 6$$

$$2x^2 + 7x + 6 = 0$$

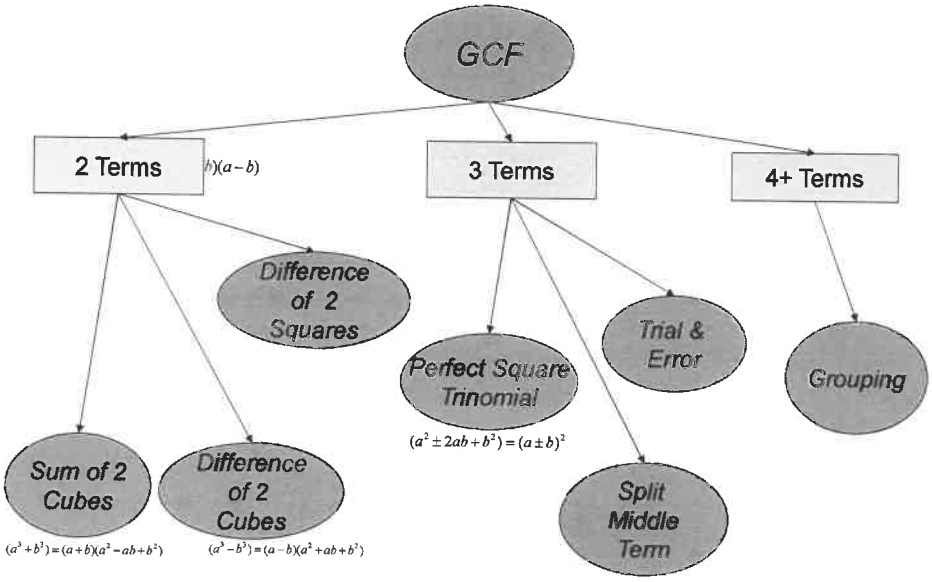
$$(2x+3)(x+2) = 0$$

$$2x + 3 = 0 \qquad x + 2 = 0$$

$$2x = -3 \qquad x = -2$$

$$x = -\frac{3}{2} \qquad x = -2$$

Factoring Methods



Worksheet: Page 173 Name:_____ Pd.___

Written Exercises

Simplify. Assume that variable exponents represent positive integers.

A

1. $3z^2 \cdot 2z^3$
2. $5r^2 \cdot r^4$
3. $(-t^4)^3$
4. $(-t^3)^4$
5. $(3x^2y)(xy^2)$
6. $(4p^2q)(p^2q^3)$
7. $(-2u^2)(uv^3)(-u^2v^2)$
8. $(r^2s)(-3rs^3)(2rs)$
9. $(4a^3b^2)^2$
10. $(2c^2d^3)^3$
11. $(-3pq^4r^2)^3$
12. $(-x^2yz^3)^4$
13. $(-z^3)(-z)^3$
14. $(-c)^2(-c^4)$
15. $(s^2t)^3(st^3)^2$
16. $(2x^2y^3)^3(3x^3y)^2$
17. $3y(y^3 - 2y^2 + 3)$
18. $x^2(x - 2x^2 + 3x^3)$
19. $rs^2(r^2 - 2rs - s^2)$
20. $p^2q^3(p^2 - 4q)$
21. $z^{n-2} \cdot z^{n+2}$
22. $t^4 \cdot t^{k-4}$
23. $x^{m-1} \cdot x \cdot x^m$
24. $y^{p+2} \cdot y^p \cdot y^{p-2}$
25. $r^{h-2}(r^{h+1})^2$
26. $s^3(s^{2k-1})^3$

B

27. $t(t^{n-1} + t^n + t^{n+1})$
28. $x^2(x^k - x^{k-1} + x^{k-2})$
29. $p^n(p^{m-n+1} + p^{m-n})$
30. $s^{2n}(s^{2m-n} - s^{m-2n})$
31. $z^{m-n}(z^{n+m} - z^{n-m} + z^n)$
32. $x^{h+k}(x^{2h-k} - x^{h-2k} + x^k)$
33. $(t^m)^n(t^n)^{n-m}$
34. $(y^{h-k})^h(y^{h+k})^k$

In Exercises 35–38, solve for n.

35. $3^{5n} = 3^5(3^{2n})^2$
36. $(2^{3n})^2 = (2^n)^3 \cdot 2^{n+6}$
37. $3 \cdot 9^{2n} = (3^{n+1})^3$
38. $4^{n+3} \cdot 16^n = 8^{3n}$

C

39. Prove the first law of exponents.
40. Prove the third law of exponents.
41. Prove that for positive integers m, n, and r, $((a^m)^n)^r = a^{mnr}$.
42. Prove that for positive integers m and n, $(a^m)^n = (a^n)^m$.

ATM

4.5 & 4.6 Factoring & Solving by Factoring Quiz RWS

Factor completely. If the polynomial cannot be factored, write prime.

Name _____

Period _____

1. $x^2 - 10x + 24$

2. $3n^3 - 15n^2 + 2n - 10$

3. $4x^2 - 64$

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

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

6. $x^3 + 8$

7. $9x^2 + 25$

8. $8x^2 + 2x - 15$

9. $7x^2 + 50x + 7$

10. $5n^2 - 18n + 9$

11. $25x^2 + 80x + 64$

Answers

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. $27x^3 - 8$

13. $20x^2 - x - 12$

14. $70xy - 84x - 10y + 12$

Solve by completely factoring.

15. $3x^2 - 5x = 0$

16. $15x^2 + 17x - 6 = -10$

17. $n^3 - 8n^2 + 15n = 0$

Factor completely.

18. $x^4 - 81$

19. $150m^2nz + 20mn^2c - 120m^2nc - 25mn^2z$

20. $2n^2 + 6n - 108$

Answers

12. _____

13. _____

14. _____

15. factors: _____

solution: _____

16. factors: _____

solution: _____

17. factors: _____

solution: _____