

More Fun with Factoring!!

FACTORING BY GROUPING:

If you can separate a polynomial into groups of the same factor, then you can identify all of the factors.

$$ac + ad + bc + bd = a(c + d) + b(c + d) = (a + b)(c + d)$$

(Can you spot our "First Outer Inner Last" here?)

Ex. $(x^2 + 3x) + (ax + 3a) = x(x + 3) + a(x + 3) = (x + a)(x + 3)$

$$(xy + x^2) + (5y + 5x) = x(y + x) + 5(y + x) = (x + 5)(y + x)$$

HINT: You can try factoring by grouping when you see a polynomial with four seemingly unrelated terms.

NOTE: Sometimes you need to do more factoring after you find the groups in order to factor *completely*.

TRY IT YOURSELF!!

$$d^3 - d^2 + cd - c =$$

$$d^3 - d^2 - cd + c =$$

$$x^3 - 4x + x^2y - 4y =$$

Homework: Factoring WS 3: #1-8, 19

FACTORING TRINOMIALS WHEN THE LEADING COEFFICIENT IS NOT 1:

*Now we must find the factors of the leading coefficient AND the constant before we begin to guess and check

*Fall-back plan: Quadratic Formula = $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

FOUR-STEP FACTORING METHOD:

1. Multiply "a" and "c"
2. Find the factors of "ac" that add up to "b"
3. Split "b" into the correct factors from Step 2.
4. Factor by Grouping

Ex. $6x^2 - 7x + 2$
Multiply 6 and 2 = _____
Split original problem:

Factors of "ac" = _____

GUIDED PRACTICE:

$$3x^2 + 11x - 4$$

Multiply 3 and 4 = _____

Factors of "ac" that add to "b"

Split, and factor by Grouping

NOW TRY IT WITHOUT MY HELP!!

$$10x^2 - 23x + 12 =$$

$$3x^2 + 2x - 16 =$$

$$15x^2 - x - 2 =$$

$$4x^2 + 12x + 9 =$$

*REMEMBER THE SHORTCUTS FROM YESTERDAY!!

*FOR THESE TYPES OF PROBLEMS, WE LOVE PRIME NUMBERS!!

Homework: Factoring WS 2: #7-14, 26

SUMS / DIFFERENCES OF CUBES:

$$(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$$

$$(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$$

"Same sign, change the sign, always a plus"

Ex. $(x^3 - 27)$ $a = x$ $b = 3$

$$(x^3 - 27) = (x - 3)(x^2 + 3x + 9)$$

$$(8x^3 - 27) $a = 2x$ $b = 3$$$

$$(8x^3 - 27) = (2x - 3)(4x^2 + 6x + 9)$$

GIVE IT A TRY!!

$$(x^3 + 1) =$$

$$(x^6 + 64) =$$

$$(125x^3 - 8) =$$

Homework: Factoring WS 1: #3, 4, 8, 11, 13

SOLVE BY FACTORING:

This is factoring so that you can find the zeros of the graph of a polynomial. When you see "Solve by factoring," you need to factor, set each factor equal to zero, and solve for x .

These are our solutions to the function.

*Think back to 9-5 when we worked with the Factor Theorem. These are our "c" values for our factors $(x - c)$.

Ex. $x^2 + 11x + 18 = 0$
 $(x + 2)(x + 9) = 0$

$$x + 2 = 0 \quad x + 9 = 0$$

$$x = -2 \quad x = -9$$

$$3x^3 - 3x^2 = 6x \quad \rightarrow \quad 3x^3 - 3x^2 - 6x = 0$$
$$3x(x^2 - x - 2) = 0$$
$$3x(x - 2)(x + 1) = 0$$

$$3x = 0 \quad x - 2 = 0 \quad x + 1 = 0$$

$$x = 0 \quad x = 2 \quad x = -1$$

NOTE: IF YOU NEED TO CHECK YOUR ANSWER, SUBSTITUTE THESE VALUES OF x BACK INTO ORIGINAL POLYNOMIAL. WHEN YOU SUBSTITUTE FOR x , THE RESULTING ANSWER *SHOULD* EQUAL ZERO.

NOW IT'S YOUR TURN!!

Solve by factoring.

$$x^2 + 9x + 18 = 0$$

$$x^2 - 5x - 14 = 0$$

Homework: Factoring WS 4: #1, 2, 7, 8, 9, 12

PRECALC I – FACTORING WORKSHEET #1

1. $64z^2 - 25$

2. $144 - 49d^6$

3. $r^3 + 8$

4. $1 + 125v^3$

5. $100 - 9m^2$

6. $64u^2 - 121v^2$

7. $3c^2 - 75$

8. $z^4 - 27z$

9. $18 - 2t^2$

10. $289c^4 - 1$

11. $64c^3 - 1$

12. $10ab - 45ab^3$

13. $a^9 + 8b^6$

14. $x^3 - 16x$

15. $16m^3 - 36m$

16. $16j^6 - 81k^8$

17. $x^{2n} - 1$

18. $x^{3n} + y^3$

19. $x^{4n} - y^2$

20. $375h^3j^3 - 3h^3k^3$

PRECALC I – FACTORING WORKSHEET #2 (TRINOMIALS)

1. $x^2 - 2x - 8$

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

3. $x^2 - 11x - 12$

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

5. $x^2 - 11x + 18$

6. $12 - 8x + x^2$

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

8. $2x^2 - 7x + 5$

9. $2x^2 - x - 21$

10. $3x^2 - 14x - 5$

11. $3x^2 - 13x + 4$

12. $6x^2 + 7x - 3$

13. $10x^2 - x - 2$

14. $12x^2 - 20x + 3$

15. $42x^2 + 41x + 5$

16. $24x^3 + 10x^2 - 4x$

17. $-7x^2y + 23xy - 6y$

18. $10x^2 + 43xy + 12y^2$

19. $7m^2 - 14m + 7$

20. $30 - p - p^2$

21. $4c^2 + 4c + 1$

22. $4x^2 + 12x + 9$

23. $15y^2 + 50y + 40$

24. $10a^2 + 49a - 5$

25. $x^4 - x^5 + x^6$

26. $4x^2y - 6xy - 4y$

27. $x^4 - 7x^2 - 8$

28. $x^{2n} - 2x^n + 1$

PRECALC I – FACTORING WORKSHEET #3

1. $3a^2 - 3ab + 2a - 2b$

14. $24r^2s^2 - 30r^3s$

2. $5r + r^2 - 5s - rs$

15. $a^2 - 36b^2$

3. $10ac + 6bd + 15bc + 4ad$

16. $2u^3v - 28u^2v + 48uv$

4. $2p^2 + 15qr + 10pq + 3pr$

17. $24x^3 + 81$

5. $c^2 - c + 3cd - 3d$

18. $36x^4 - 13x^2 + 1$

6. $p^2 - 2p + pq - 2q$

19. $s^2(s - 1) + 11s(s - 1) + 10(s - 1)$

7. $2xz - 21wy - 14yz + 3wx$

20. $6y^4 - 9y^3 + 12y^2$

8. $6a^2 - 5bc + 2ab - 15ac$

21. $50z^3 - 2z$

9. $a^2 + 12a + 36 - b^2$

22. $4a^3 + 8a^2 + 4a$

10. $25x^2 - 10x + 1 - y^2$

23. $y^2 - 7y - 30$

11. $c^2 - 4cd + 4d^2 - 25$

24. $4x^3 + 4$

12. $4 + 28s + 49s^2 - t^2$

25. $x^{16} - 1$

13. $d^3 - d^2 - cd + c$

PRECALC I – FACTORING WORKSHEET #4

Solve by Factoring:

1. $y^2 - 16y + 64 = 0$

2. $9z = 10z^2$

3. $c^2 = 2c + 99$

4. $3d^2 + 24d + 45 = 0$

5. $4j^2 + 6 = 11j$

6. $12m^3 - 8m^2 = 15m$

7. $9 = 64p^2$

8. $x^2 + x = 6$

9. $2y^2 - 242 = 0$

10. $4x^5 - 4x = 0$

11. $e^2 = 8e - 16$

12. $3f^2 - 9f = -12f^3$

FACTORIZING STUDY GUIDE

FACTOR COMPLETELY:

1. $24r^2s^2 - 30r^3s$

2. $25y^2 - 36z^2$

3. $9c^2 - 12c + 4$

4. $4a^3 - 8a^2 + 4a$

5. $4a^3 + 4a^2 - 80a$

6. $y^2 - 7y - 30$

7. $64z^2 - 25$

8. $x^{16} - 1$

9. $6x^2 + 7x - 5$

10. $X^3 - 16x$

11. $8x^3 - 27$

12. $X^2 + 5x - 14$

13. $x^2 + 2x - xy - 2y$

14. $49m^2 - 28mn + 4n^2 - 81$

15. $6r^2s^2 - 90r^3s - sr$

16. $144 - 49d^6$

$$17. 2x^2 + x - 3$$

$$18. x^{4n} - y^2$$

$$19. 8 - x^3$$

$$20. 4x^3 + 4$$

$$21. 4a^2 + 12a + 5na + 15n$$

$$22. 7vy^2 - v^5y^3 + v^2y^4 + 12vy^3$$

$$23. 3f^2 - 75$$

$$24. X^2 - 2x - 8$$

$$25. x^2 + 4x + 3$$

$$26. 9x^2 - 25$$

$$27. 25x^2 - 10x + 1$$

$$28. 10x^2 - x - 2$$

$$29. a^9 + 8b^6$$

$$30. 4a^2 + 12ab + 9b^2 - 25c^2$$

$$31. 3x^2 - 13x - 10$$

$$32. 9x^2 + 13x - 10$$

$$33. 64x^3 + 27$$

$$34. X^{3n} - y^3$$

$$35. 3x^2 + 7xy + 4y^2$$

$$36. X^{20} - y^{10}$$

SOLVE:

$$37. x^2 + 4x - 5 = 0$$

$$38. 2x^2 - 5x - 12 = 0$$

$$39. 0 = 30 - p - p^2$$

$$40. 3x^2 + 11x = -6$$

$$41. 9z = 10z^2$$

$$42. 12m^3 = 15m + 8m^2$$

$$43. x^2 + 16 = 8x$$

$$44. y^3 - 64y = 0$$