Factoring Review

GCF's and Grouping

1. $8x^2y - 4xy^3$ GCF
$= 4xy(2x - y^2)$

2. $-4x^3 - 8x^2 + 24x$ GCF
$= -4x(x^2 + 2x - 6)$

3. $3x(a+2b) + y(a+2b)$
$= (a+2b)(3x+y)$
$a+2b$ is GCF

4. $12x^2(3x-y)^2 - 6x(3x-y)$
$= 6x(3x-y)[2x(3x-y) - 1]$
$6x(3x-y)$ is GCF
$= 6x(3x-y)(6x^2 - 2xy - 1)$

5. $24x^3y^4 - 12x^2y^3 - 8xy^5$
$= 4xy^3(6x^2y - 3x - 2y^2)$
GCF

6. $ax - 2xb + ay - 2by$
use grouping
$= x(a-2b) + y(a-2b)$
$= (a-2b)(x+y)$

7. $x^3 - 4x^2 + 2xy - 8y$ use grouping
$= x^2(x-4) + 2y(x-4)$
$= (x-4)(x^2+2y)$

8. $2bx^3 - 4x^3 - 8bx^2y + 16x^2y$
$= 2x^2(bx - 2x - 4by + 8y)$ GCF first
$= 2x^2[x(b-2) - 4y(b-2)]$ grouping
$= 2x^2(b-2)(x-4y)$

Factoring Trinomials

9. x^2-2x-3

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

10. x^2-5x+6

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

11. $x^2-7x-60$

$=(x-12)(x+5)$

12. $2x^2-4x-96$

GCF first

$=2(x^2-2x-48)$

$=2(x-8)(x+6)$

13. $-x^2-17x-72$

make sure → leading coefficient is positive

$=-1(x^2+17x+72)$

$=-1(x+8)(x+9)$

14. $3x^2+10x-8$

$=(3x-2)(x+4)$

15. $5x^2-14x-3$

$=(5x+1)(x-3)$

16. $2x^2+9x-5$

$=(2x-1)(x+5)$

17. $6x^2-19x-20$

$=(6x+5)(x-4)$

18. $-4x^3+10x^2+6x$

GCF first

$=-2x(2x^2-5x-3)$

$=-2x(2x+1)(x-3)$

19. $12x^2+xy-35y^2$

$=(3x-5y)(4x+7y)$

20. $20a^3-42a^2b-20ab^2$

GCF first

$=2a(10a^2-21ab-10b^2)$

$=2a(2a-5b)(5a+2b)$

Factoring Binomials

$a^2-b^2=(a+b)(a-b)$ $\quad a^2+b^2 \Rightarrow$ prime (unless a GCF)

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

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

21. x^2-36 $\quad a^2-b^2$

$=(x+6)(x-6)$

22. $4x^2-81$ $\quad a^2-b^2$

$=(2x+9)(2x-9)$

23. $16x^2-25y^2$ $\quad a^2-b^2$

$=(4x+5y)(4x-5y)$

24. $16x^4-1$ $\quad a^2-b^2$

$=(4x^2+1)(4x^2-1)$ $\quad a^2-b^2$

$=(4x^2+1)(2x+1)(2x-1)$

25. $18x^2-50$ $\quad$ GCF first

$=2(9x^2-25)$ $\quad$ then a^2-b^2

$=2(3x+5)(3x-5)$

26. x^3-64 $\quad a^3-b^3$

$=(x-4)(x^2+4x+16)$

27. x^3+27 $\quad a^3+b^3$

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

28. $8x^3-125y^3$ $\quad a^3-b^3$

$=(2x-5y)(4x^2+10xy+25y^2)$

29. $54x^3y-16y^4$ $\quad$ GCF 1st

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

$=2y(3x-2y)(9x^2+6xy+4y^2)$

30. $(x+1)^3+y^3$ $\quad a^3+b^3$

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

$=(x+1+y)(x^2+2x+1-xy-y+y^2)$

"Harder" Grouping Problems

31. $x^2y + 2x^2 - 4y - 8$

$= x^2(y+2) - 4(y+2)$ grouping

$= (y+2)(x^2-4) = (y+2)(x+2)(x-2)$

$a^2 - b^2$

32. $4x^3 + 8x^2 - 9x - 18$

$= 4x^2(x+2) - 9(x+2)$ grouping

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

$a^2 - b^2$

33. $x^2 + 2x + 1 - 4y^2$ group 3 terms and 1

$= (x+1)^2 - 4y^2 = [(x+1)+2y][(x+1)-2y]$

$= (x+1+2y)(x+1-2y)$

34. $4x^2 - 20xy + 25y^2 - 81$ group 3 terms and 1

$= (2x-5y)^2 - 81$

$= [(2x-5y)+9][(2x-5y)-9]$

$= (2x-5y+9)(2x-5y-9)$

35. $5x^3y - 40y - 6x^3 + 48$

$= 5y(x^3 - 8) - 6(x^3 - 8)$ grouping

$= (x^3 - 8)(5y - 6)$

$a^3 - b^3$ → $= (x-2)(x^2+2x+4)(5y-6)$

Mixed Review of Factoring

36. $25a^2 - b^2$

$a^2 - b^2$ $= (5a+b)(5a-b)$

37. $x^2 - 10x + 9$

$= (x-9)(x-1)$

38. $36x^2 - 60x + 25$

perfect square trinomial $= (6x-5)^2$

39. $16x^3y - 54y^4$

GCF → $= 2y(8x^3 - 27y^3)$

$a^3 - b^3$ → $= 2y(2x-3y)(4x^2+6xy+9y^2)$

40. $14x^2 - 41x + 15$

$= (2x-5)(7x-3)$

41. $3x^2 - 5x + 1$

prime

42. $x^3 - 2x^2 - 16x + 32$

$= x^2(x-2) - 16(x-2)$ grouping

$= (x-2)(x^2-16)$ ← $a^2 - b^2$

$= (x-2)(x+4)(x-4)$

43. $-5x^2 + 25x + 30$

GCF 1st $= -5(x^2 - 5x - 6)$

$= -5(x-6)(x+1)$

44. $10x^2 - 17x - 20$

$= (2x-5)(5x+4)$

45. $4x^4 - 25x^2 + 36$

both are $a^2 - b^2$

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

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

46. $20x^2 - 18xy - 12x^2y + 30x$

GCF $= 2x(10x - 9y - 6xy + 15)$

rearrange terms then use grouping

$= 2x(10x + 15 - 6xy - 9y)$

$= 2x[5(2x+3) - 3y(2x+3)]$

$= 2x(2x+3)(5-3y)$