

1. $x(a+2) - 2(a+2) = (a+2)(x-2)$

2. $3(x+y) + a(x+y) = (x+y)(3+a)$

3. $m(x-3) + k(x-3) = (x-3)(m+k)$

4. $a(y+1) - b(y+1) = (y+1)(a-b)$

5. $x^2 + 3x + 2xy + 6y = (x^2 + 3x) + (2xy + 6y) = x(x+3) + 2y(x+3) = (x+3)(x+2y)$

6. $y^2 - 5wy + 4y - 20w = (y^2 - 5wy) + (4y - 20w) = y(y-5w) + 4(y-5w) = (y-5w)(y+4)$

7. $xy + 4y - 2x - 8 = (xy + 4y) - (2x + 8) = y(x+4) - 2(x+4) = (x+4)(y-2)$

8. $ab + 7b - 3a - 21 = (ab + 7b) - (3a + 21) = b(a+7) - 3(a+7) = (a+7)(b-3)$

9. $ax + bx + ay + by = (a + b)(x + y) = (x + y)(a + b)$

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

11. $2x^2 - 6xy + 5x - 15y = (2x^2 - 6xy) + (5x - 15y) = 2x(x-3y) + 5(x-3y) = (x-3y)(2x+5)$

12. $3x^2 - 6xy + 2x - 4y = (3x^2 - 6xy) + (2x - 4y) = 3x(x-2y) + 2(x-2y) = (x-2y)(3x+2)$

13. $2ax + 6xc + ba + 3bc = (2ax + 6xc) + (ba + 3bc) = 2x(a+3c) + b(a+3c) = (a+3c)(2x+b)$

14. $x^2y - 3x^2 - 2y + 6 = (x^2y - 3x^2) - (2y - 6) = x^2(y-3) - 2(y-3) = (y-3)(x^2-2)$

15. $6 + 2y + 3x^2 + x^2y = (6 + 2y) + (3x^2 + x^2y) = 2(3+y) + x^2(3+y) = (3+y)(2+x^2)$

$$16. 2x^2 - 3x + 1 = (2x - 1)(x - 1)$$

$$17. 2x^2 - 7x + 3 = (2x - 1)(x - 3)$$

$$18. 6x^2 + 7x + 2 = (3x + 2)(x + 1)$$

$$19. 4x^2 + 8x + 3 = (2x + 1)(2x + 3)$$

$$20. 6x^2 - 7x + 2 = (3x - 2)((2x - 1)$$

$$21. 4x^2 - 9x + 2 = (4x - 1)(x - 2)$$

$$22. 2x^2 - 3x - 2 = (2x + 1)(x - 2)$$

$$23. 12x^2 - x - 1 = (4x + 1)(3x - 1)$$

$$24. 6x^2 + 19x + 3 = (6x + 1)(x + 3)$$

$$25. 12y^2 - 5y - 2 = 12y^2 - 8y + 3y - 2 = (12y^2 - 8y) + (3y - 2) = 4y(3y - 2) + 1(3y - 2) = (3y - 2)(4y + 1)$$

$$26. 10y^2 + 21y - 10 = 10y^2 + 25y - 4y - 10 = (10y^2 + 25y) - (4y + 10) = 5y(2y + 5) - 2(2y + 5) = (2y + 5)(5y - 2)$$

$$27. 5y^2 + 13y + 6 = 5y^2 + 10y + 3y + 6 = (5y^2 + 10y) + (3y + 6) = 5y(y + 2) + 3(y + 2) = (y + 2)(5y + 3)$$

$$28. 16y^2 + 10y + 1 = 16y^2 + 8y + 2y + 1 = (16y^2 + 8y) + (2y + 1) = 8y(2y + 1) + 1(2y + 1) = (2y + 1)(8y + 1)$$

$$29. 16x^2 - 14x + 3 = 16x^2 - 8x - 6x + 3 = (16x^2 - 8x) - (6x - 3) = 8x(2x - 1) - 3(2x - 1) = (2x - 1)(8x - 3)$$

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$$30. 16x^2 + 16x + 3 = 16x^2 + 12x + 4x + 3 = (16x^2 + 12x) + (4x + 3) = 4x(4x + 3) + 1(4x + 3) = (4x + 3)(4x + 1)$$

$$31. 10x^2 - 3x - 1 = 10x^2 - 5x + 2x - 1 = (10x^2 - 5x) + (2x - 1) = 5x(2x - 1) + 1(2x - 1) = (2x - 1)(5x + 1)$$

$$32. 9x^2 + 25x - 6 = 9x^2 + 27x - 2x - 6 = (9x^2 + 27x) - (2x + 6) = 9x(x + 3) - 2(x + 3) = (x + 3)(9x - 2)$$

$$33. 14x^2 + 15x - 9 = 14x^2 + 21x - 6x - 9 = (14x^2 + 21x) - (6x + 9) = 7x(2x + 3) - 3(2x + 3) = (2x + 3)(7x - 3)$$

$$34. 2x^3 + 8x^2 + x + 4 = (2x^3 + 8x^2) + (x + 4) = 2x^2(x + 4) + 1(x + 4) = (x + 4)(2x^2 + 1)$$

$$35. 8x^4 + 6x - 28x^3 - 21 = (8x^4 + 6x) - (28x^3 + 21) = 2x(4x^3 + 3) - 7(4x^3 + 3) = (4x^3 + 3)(2x - 7)$$

$$36. 5x^3 - x^2 + 15x - 3 = (5x^3 - x^2) + (15x - 3) = x^2(5x - 1) + 3(5x - 1) = (5x - 1)(x^2 + 3)$$

$$37. x^3 + 3x^2 + 4x + 12 = (x^3 + 3x^2) + (4x + 12) = x^2(x + 3) + 4(x + 3) = (x + 3)(x^2 + 4)$$

$$38. 6x^3 + 3x^2 + 2x + 1 = (6x^3 + 3x^2) + (2x + 1) = 3x^2(2x + 1) + 1(2x + 1) = (2x + 1)(3x^2 + 1)$$

$$39. 3x^3 + 9x^2 + 2x + 6 = (3x^3 + 9x^2) + (2x + 6) = 3x^2(x + 3) + 2(x + 3) = (x + 3)(3x^2 + 2)$$

$$40. 9x^3 - 12x^2 + 3x - 4 = (9x^3 - 12x^2) + (3x - 4) = 3x^2(3x - 4) + 1(3x - 4) = (3x - 4)(3x^2 + 1)$$

$$41. 10x^3 - 25x^2 + 4x - 10 = (10x^3 - 25x^2) + (4x - 10) = 5x^2(2x - 5) + 2(2x - 5) = (2x - 5)(5x^2 + 2)$$

$$42. 4x^3 - 20x^2 + 3x - 15 = (4x^3 - 20x^2) + (3x - 15) = 4x^2(x - 5) + 3(x - 5) = (x - 5)(4x^2 + 3)$$

$$43. \begin{aligned} 144x^3 - 258x^2 + 105x &= 3x(48x^2 - 86x + 35) = 3x(48x^2 - 56x - 30x + 35) = 3x\{(48x^2 - 56x) - (30x - 35)\} \\ &= 3x\{8x(6x - 7) - 5(6x - 7)\} = 3x \cdot (6x - 7) \cdot (8x - 5) \end{aligned}$$

$$\begin{aligned} 44. \quad 28x^3 + 212x^2 + 112x &= 4x(7x^2 + 53x + 28) = 4x(7x^2 + 49x + 4x + 28) = 4x\{(7x^2 + 49x) + (4x + 28)\} \\ &= 4x\{7x(x + 7) + 4(x + 7)\} = 4x \cdot (x + 7) \cdot (7x + 4) \end{aligned}$$