

Grouping

1. $8x^3 - 64x^2 + x - 8 = (8x^3 - 64x^2) + (x - 8) = 8x^2(x - 8) + 1(x - 8) = (8x^2 + 1)(x - 8)$

2. $12y^3 - 21y^2 + 28y - 49 = (12y^3 - 21y^2) + (28y - 49) = 3y^2(4y - 7) + 7(4y - 7) = (3y^2 + 7)(4y - 7)$

3. $6x^3 - 16x^2 + 21x - 56 = (6x^3 - 16x^2) + (21x - 56) = 2x^2(3x - 8) + 7(3x - 8) = (2x^2 + 7)(3x - 8)$

4. $12z^3 + 2z^2 - 30z - 5 = (12z^3 + 2z^2) + (-30z - 5) = 2z^2(6z + 1) - 5(6z + 1) = (2z^2 - 5)(6z + 1)$

5. $63y^3 + 54y^2 - 105y - 90 = (63y^3 + 54y^2) + (-105y - 90) = 9y^2(7y + 6) - 15(7y + 6) = (9y^2 - 15)(7y + 6) = 3(3y^2 - 5)(7y + 6)$

6. $25a^3 + 5a^2 + 30a + 6 = (25a^3 + 5a^2) + (30a + 6) = 5a^2(5a + 1) + 6(5a + 1) = (5a^2 + 6)(5a + 1)$

7. $96x^3 - 84x^2 + 112x - 98 = (96x^3 - 84x^2) + (112x - 98) = 12x^2(8x - 7) + 14(8x - 7) = (12x^2 + 14)(8x - 7) = 2(6x^2 + 7)(8x - 7)$

8. $4z^3 - 12z^2 - 5z + 15 = (4z^3 - 12z^2) + (-5z + 15) = 4z^2(z - 3) - 5(z - 3) = (4z^2 - 5)(z - 3)$

9. $24y^3 + 15y^2 - 56y - 35 = (24y^3 + 15y^2) + (-56y - 35) = 3y^2(8y + 5) - 7(8y + 5) = (3y^2 - 7)(8y + 5)$

10. $56xw + 49xk^2 - 24yw - 21yk^2 = (56xw + 49xk^2) + (-24yw - 21yk^2) = 7x(8w + 7k^2) - 3y(8w + 7k^2) = (7x - 3y)(8w + 7k^2)$

11. $12x^2u + 3x^2v + 28yu + 7yv = (12x^2u + 3x^2v) + (28yu + 7yv) = 3x^2(4u + v) + 7y(4u + v) = (3x^2 + 7y)(4u + v)$

12. $12bc - 4bd - 15xc + 5xd = (12bc - 4bd) + (-15xc + 5xd) =$
 $4b(3c - d) - 5x(3c - d) = (4b - 5x)(3c - d)$
13. $56xy - 35x + 16ry - 10r = (56xy - 35x) + (16ry - 10r) = 7x(8y - 5) + 2r(8y - 5) =$
 $(7x + 2r)(8y - 5)$
14. $5a^2w - 4a^2y + 15xw - 12xy = (5a^2w - 4a^2y) + (15xw - 12xy) =$
 $a^2(5w - 4y) + 3x(5w - 4y) = (a^2 + 3x)(5w - 4y)$
15. $21xy - 12b^2 + 14xb - 18by = (21xy + 14xb) + (-12b^2 - 18by) =$
 $7x(3y + 2b) - 6b(3y + 2b) = (7x - 6b)(3y + 2b)$
16. $28xy + 25 + 35x + 20y = (28xy + 35x) + (20y + 25) = 7x(4y + 5) + 5(4y + 5) =$
 $(7x + 5)(4y + 5)$
17. $30uv + 30u + 36u^2 + 25v = (30uv + 36u^2) + (30u + 25v) =$
 $6u(5v + 6u) + 5(5v + 6u) = (6u + 5)(5v + 6u)$
18. $9mz - 4nc + 3mc - 12nz = (9mz - 12nz) + (-4nc + 3mc) =$
 $3z(3m - 4n) + c(3m - 4n) = (3z + c)(3m - 4n)$
19. $4xy + 6 - x - 24y = (4xy - x) + (6 - 24y) = x(4y - 1) - 6(4y - 1) = (x - 6)(4y - 1)$
20. $21xy + 15x + 35ry + 25r = (21xy + 15x) + (35ry + 25r) =$
 $3x(7y + 5) + 5r(7y + 5) = (3x + 5r)(7y + 5)$