

Other Types of Factoring

Grouping

$$1. pq + 2qr + 2r^2 + pr = (2r + p)(r + q)$$

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

$$3. 3rs - s + 12r - 4 = (3r - 10)(s + 4)$$

$$4. 2x^3 - 6x^2 - 5x + 15 = (x - 3)(2x^2 - 5)$$

$$5. x^2 + 6x + 9 - y^2 = [(x + 3) + y][(x + 3) - y]$$

$$6. x^2 + 10x + 25 - y^2 = [(x + 5) - y][(x + 5) + y]$$

$$7. 25 - a^2 - 4ab - 4b^2 = [5 - (a + 2b)][5 + (a + 2b)]$$

$$8. a^2 - b^2 - 10bc - 25c^2 = [a + (b + 5c)][a - (b + 5c)]$$

$$9. h^2 - 12h + 36 - k^2 = [(h - 6) + k][(h - 6) - k]$$

$$10. y^2 + 16 + 8y - 25x^2 = [(y + 4) + 5x][(y + 4) - 5x]$$

$$11. 4ab + 16 - a^2 - 4b^2 = [4 - (a + 2b)][4 + (a + 2b)]$$

$$12. 9x^4 - 9y^2 - m^2 - 6my = \\ [3x^2 - (3y + m)][3x^2 + (3y + m)]$$

Cubes:

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

$$2. a^3 - 8b^3 = (a - 2b)(a^2 + 2ab + 4b^2)$$

$$3. 125c^3 - 1 = (5c - 1)(25c^2 + 5c + 1)$$

$$4. 16x^3 - 250 = 2(2x - 5)(4x^2 + 10x + 25)$$

$$5. y^5 - 64x^3y^2 = y^2(y - 4x)(y^2 + 4xy + 16x^2)$$

$$6. (x - 1)^3 - (y + 2)^3 = \\ [(x - 1) - (y + 2)][(x - 1)^2 + (x - 1)(y + 2) + (y + 2)^2]$$

$$7. x^9 - y^{12} = (x^3 - y^4)(x^6 + x^3y^4 + y^8)$$

$$8. x^3 + y^3 = (x + y)(x^2 - xy + y^2)$$

$$9. 729 + z^3 = (9 + z)(81 - 9z + z^2)$$

$$10. x^6 + y^9 = (x^2 + y^3)(x^4 - x^2y^3 + y^6)$$

$$11. (2a + 1)^3 + (x - y)^3 = \\ [(2a + 1) + (x - y)][(2a + 1)^2 - (2a + 1)(x - y) + (x - y)^2]$$

$$12. x^9y^{15} + a^{27}b^{30} = \\ (x^3y^5 + a^9b^{10})(x^6y^{10} - x^3y^5a^9b^{10} + a^{18}b^{20})$$

$$13. x^{3a} + 27 = (x^a + 3)(x^{2a} - 3x^a + 9)$$

$$14. 128x^5y^7 + 54x^2y = \\ 2x^2y(4xy^2 + 3)(16x^2y^4 - 12xy^2 + 9)$$

Synthetic Substitution

$$1. x^3 - 2x^2 - 5x + 6 = (x - 3)(x - 1)(x + 2)$$

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

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

$$4. x^5 + 3x^4 - 5x^3 - 15x^2 + 4x + 12 = \\ (x - 2)(x - 1)(x + 1)(x + 2)(x + 3)$$

$$5. x^5 - 9x^4 + 27x^3 - 23x^2 - 24x + 36 = \\ (x - 3)^2(x - 2)^2(x + 1)$$

$$6. x^5 - x^4 - 3x^3 + 5x^2 - 2x = (x - 1)^3x(x + 2)$$

$$7. -x^3 - 2x^2 + 5x + 6 = (2 - x)(x + 1)(x + 3)$$

$$8. -x^4 - 2x^3 + 13x^2 - 10x = (2 - x)(x - 1)x(x + 5)$$