

# Important Algebraic Formulas

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

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

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

$$a^2 + b^2 = (a + b)^2 - 2ab \quad \text{or} \quad a^2 + b^2 = (a - b)^2 + 2ab$$

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

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

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

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

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

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

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

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

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

$$(a + b - c)^2 = a^2 + b^2 + c^2 + 2ab - 2bc - 2ca$$

$$(a - b - c)^2 = a^2 + b^2 + c^2 - 2ab + 2bc - 2ca$$

$$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$$

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

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

$$\text{if } a + b + c = 0 \text{ then } a^3 + b^3 + c^3 = 3abc$$

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