

Factors and Expansions

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

$$(a \pm b)^3 = a^3 \pm 3a^2b + 3ab^2 \pm b^3$$

$$(a \pm b)^4 = a^4 \pm 4a^3b + 6a^2b^2 \pm 4ab^3 + b^4$$

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

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

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

$$a^4 + b^4 = (a^2 + ab\sqrt{2} + b^2)(a^2 - ab\sqrt{2} + b^2)$$

$$a^n - b^n = (a - b)(a^{n-1} + a^{n-2}b + \dots + b^{n-1})$$

$$a^n - b^n = (a + b)(a^{n-1} - a^{n-2}b + \dots - b^{n-1}) \quad \text{for even values of } n$$

$$a^n + b^n = (a + b)(a^{n-1} - a^{n-2}b + \dots + b^{n-1}) \quad \text{for odd values of } n$$

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

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

$$(a + b + c)^3 = a^3 + b^3 + c^3 + 3a^2(b + c) + 3b^2(a + c) + 3c^2(a + b) + 6abc$$

$$a^3 + b^3 + c^3 = (a + b + c)^3 - 3(a + b)(b + c)(a + c)$$