



## Некоторые более сложные примеры

Разложить на множители

$$1)(*) x^4 + 4 = x^4 + 4x^2 + 4 - 4x^2 = (x^2 + 2)^2 - 4x^2 = (x^2 + 2 - 2x)(x^2 + 2 + 2x)$$

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

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

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

$$3)(*) x^4 - 21x^2 + 4 = x^4 - 21x^2 + 4 + 4x^2 - 4x^2 = (x^2+2)^2 - 21x^2 - 4x^2 = (x^2+2)^2 - 25x^2 = (x^2 + 2 + 5x)(x^2 + 2 - 5x)$$

$$4)(**) x^3 + y^3 + z^3 - 3xyz =$$

$$5)(*) (x + y + z)^3 - x^3 - y^3 - z^3 = (y+z)((x+y+z)^2 + x(x+y+z) + x^2) - (y+z)(y^2 - yz + z^2) = (y+z)(x^2+y^2+z^2+2xy+2xz+2yz + x^2 + xy + xz + x^2-y^2+yz-z^2) = (y+z)(3x^2+3xy+3xz+3yz) = 3(y+z)(x^2+xy+xz+yz) = 3(y+z)((x^2 + xz) + (xy+yz)) = 3(y+z)(x(x+z) + y(x+z)) = 3(y+z)(x+y)(x+z)$$

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

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

$$(x+y+z)^2 = x^2+y^2+z^2+2xy+2xz+2yz$$

$$(x+y+z+u)^2 = x^2+y^2+z^2+u^2+2xy+2xz + 2xu + 2yz + 2yu + 2zu$$

$$6)(*) x^4 + x^2y^2 + y^4 = x^4 + x^2y^2 + y^4 + 2x^2y^2 - 2x^2y^2 = (x^2+y^2)^2 - x^2y^2 = (x^2+y^2 - xy)(x^2+y^2+xy)$$

$$7)(*) a^4 - 2a^3 + a^2 - 1 = a^2(a^2 - 2a + 1) - 1 = a^2(a-1)^2 - 1 = [a(a-1)]^2 - 1 = (a(a-1)-1)(a(a-1)+1) = (a^2-a-1)(a^2-a+1)$$

$$8)(*) c^8 - c^4 - 2c^2 - 1 = c^8 - (c^4 + 2c^2 + 1) = c^8 - (c^2 + 1)^2 = (c^4 - c^2 - 1)(c^4 + c^2 + 1)$$

$$9)(*) 8x^3 + y^3 + 6y^2 + 12y + 8 = 8x^3 + y^3 + 3y^2 * 2 + 3 * y * 2^2 + 2^3 = 8x^3 + (y+2)^3 = (2x+y+2)(4x^2 - 2x*(y+2) + (y+2)^2) = (2x+y+2)(4x^2 - 2xy - 4x + y^2 + 4y + 4)$$

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

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