

Разложить на множители

1)(\*)  $x^4 + 4 = \dots$

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

3)(\*)  $x^4 - 21x^2 + 4 = \dots$

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

5)(\*)  $(x + y + z)^3 - x^3 - y^3 - z^3 = \dots$

6)(\*)  $x^4 + x^2y^2 + y^4 = \dots$

7)(\*)  $a^4 - 2a^3 + a^2 - 1 = \dots$

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

9)(\*)  $8x^3 + y^3 + 6y^2 + 12y + 8 = \dots$

$$\begin{aligned} 1) \quad x^4 + 4 &= x^4 + 4 + 2 \cdot 2 \cdot x^2 - 2 \cdot 2 \cdot x^2 = \\ &= x^4 + 4 + 4x^2 - 4x^2 = (x^2 + 2)^2 - 4x^2 = \\ &= (x^2 + 2 - 2x)(x^2 + 2 + 2x) \end{aligned}$$

$$\begin{aligned} 2) \quad 2bc + a^2 - b^2 - c^2 &= -(b^2 - 2bc + c^2) + a^2 = \\ &= -(b-c)^2 + a^2 = a^2 - (b-c)^2 = (a-(b-c))(a+(b-c)) = \\ &= (a-b+c)(a+b-c) \end{aligned}$$

$$\begin{aligned} 3) \quad x^4 - 21x^2 + 4 &= x^4 - 4x^2 - 17x^2 + 4 = \\ &= (x^2 - 2)^2 - 17x^2 = (x^2 - 2 - \sqrt{17}x)(x^2 - 2 + \sqrt{17}x) \end{aligned}$$

$$\begin{aligned} x^4 - 21x^2 + 4 &= x^4 + 4x^2 - 25x^2 + 4 = \\ &= (x^2 + 2)^2 - 25x^2 = (x^2 + 2 - 5x)(x^2 + 2 + 5x) \end{aligned}$$

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

5)  $(x + y + z)^3 - x^3 - y^3 - z^3 =$

$$\begin{aligned} ((x+y+z)-x)((x+y+z)^2 + (x+y+z)(x) + x^2) - (y^3 + z^3) &= \\ = (y+z)((x+y+z)^2 + (x^2 + xy + xz) + x^2) - (y+z)(y^2 - yz + z^2) &= \\ = (y+z)((x+y+z)^2 + (x^2 + xy + xz) + x^2) - (y+z)(y^2 - yz + z^2) &= \end{aligned}$$

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

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

$$= 3(y+z)(x(x+y) + z(x+y)) = 3(y+z)(x+z)(x+y)$$

6)  $x^4 + x^2y^2 + y^4 = x^4 + x^2y^2 + x^2y^2 + y^4 =$

$$= (x^2 + y^2)^2 - x^2y^2 = ((x^2 + y^2) - xy)((x^2 + y^2) + xy) =$$

$$(x^2 + y^2 - xy)(x^2 + y^2 + xy)$$

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

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



$$(x-y)^2 = x^2 - 2xy + y^2$$

$$x^2 - y^2 = (x-y)(x+y)$$

**ПОМОЩЬ к ДЗ**

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

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

$$(x+y)^2 = x^2 + y^2 + 2xy$$

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