

式と証明 1 3 次式の展開と因数分解

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$$\begin{aligned}(a+b+c)^3 &= \{a+(b+c)\}^3 \\&= a^3 + 3a^2(b+c) + 3a(b+c)^2 + (b+c)^3 \\&= a^3 + 3a^2b + 3a^2c + 3ab^2 + 6abc + 3ac^2 + b^3 + 3b^2c + 3bc^2 + c^3 \\&= a^3 + b^3 + c^3 + 3a^2b + 3ab^2 + 3b^2c + 3bc^2 + 3c^2a + 3ca^2 + 6abc\end{aligned}$$

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(1)

$$\begin{aligned}x^3 - 3x^2 + 6x - 8 &= (x^3 - 8) - (3x^2 - 6x) \\&= (x-2)(x^2 + 2x + 4) - 3x(x-2) \\&= (x-2)\{(x^2 + 2x + 4) - 3x\} \\&= (x-2)(x^2 - x + 4)\end{aligned}$$

(2)

$$\begin{aligned}8a^3 &= (2a)^3, \quad -27b^3 = (-3b)^3 \text{ であることに着目すると,} \\8a^3 - 36a^2b + 54ab^2 - 27b^3 &= (2a)^3 + 3 \cdot (2a)^2 \cdot (-3b) + 3 \cdot 2a \cdot (-3b)^2 + (-3b)^3 \\&= \{2a + (-3b)\}^3 \\&= (2a - 3b)^3\end{aligned}$$