

$x^{48} - 1$ を整式の範囲で因数分解せよ。

(解答)

$$\begin{aligned}x^{48} - 1 &= (x^{24} + 1)(x^{24} - 1) \\&= (x^{24} + 1)(x^{12} + 1)(x^{12} - 1) \\&= (x^{24} + 1)(x^{12} + 1)(x^6 + 1)(x^6 - 1) \\&= (x^{24} + 1)(x^{12} + 1)(x^6 + 1)(x^3 + 1)(x^3 - 1) \\&= (x^{24} + 1)(x^{12} + 1)(x^6 + 1)(x + 1)(x^2 - x + 1)(x - 1)(x^2 + x + 1) \\&= (x + 1)(x - 1)(x^2 - x + 1)(x^2 + x + 1)(x^6 + 1)(x^{12} + 1)(x^{24} + 1)\end{aligned}$$