

## 64. 高次方程式 (複2次式)

$$(1) x = \pm 3, \pm 2i \quad (2) x = \pm\sqrt{3}, \pm 2 \quad (3) x = \pm\frac{\sqrt{5}}{5}, \pm\sqrt{3}i$$

$$(4) x = \pm\frac{\sqrt{5}}{5}, \pm\sqrt{3}i \quad (5) x = -1 \pm i, 1 \pm i \quad (6) x = \frac{-1 \pm \sqrt{5}i}{2}, \frac{1 \pm \sqrt{5}i}{2}$$

次の方程式を解け。

$$(1) x^4 - 5x^2 - 36 = 0 \Leftrightarrow (x^2 - 9)(x^2 + 4) = 0$$

$$x^2 = 9, -4$$

$$x = \pm 3, \pm 2i$$

$$(2) x^4 - 7x^2 + 12 = 0 \Leftrightarrow (x^2 - 3)(x^2 - 4) = 0$$

$$x^2 = 3, 4$$

$$x = \pm\sqrt{3}, \pm 2$$

$$(3) x^4 + 13x^2 + 12 = 0 \Leftrightarrow (x^2 + 1)(x^2 + 12) = 0$$

$$x^2 = -1, -12$$

$$x = \pm i, \pm 2\sqrt{3}i$$

$$(4) 5x^4 + 14x^2 - 3 = 0 \Leftrightarrow (5x^2 - 1)(x^2 + 3) = 0$$

$$x^2 = \frac{1}{5}, -3$$

$$x = \pm\frac{\sqrt{5}}{5}, \pm\sqrt{3}i$$

$$(5) x^4 + 4 = 0 \Leftrightarrow x^4 + 4x^2 + 4 - 4x^2 = 0 \Leftrightarrow (x^2 + 2)^2 - (2x)^2 = 0 \Leftrightarrow (x^2 + 2x + 2)(x^2 - 2x + 2) = 0$$

$$x = -1 \pm i, 1 \pm i$$

$$(6) x^4 + x^2 + 1 = 0 \Leftrightarrow x^4 + 2x^2 + 1 - x^2 = 0 \Leftrightarrow (x^2 - 1)^2 - x^2 = 0 \Leftrightarrow (x^2 + x - 1)(x^2 - x - 1) = 0$$

$$x = \frac{-1 \pm \sqrt{5}i}{2}, \frac{1 \pm \sqrt{5}i}{2}$$