

CW 2 /

$$\underline{4}x^3 + \underline{16}x^2 + \underline{13}x + \boxed{3} = 0$$

$$a \in \left\{ \begin{array}{l} +3 \\ -3 \\ +1 \\ -1 \end{array} \right\}$$

$$w(1) = 4 + 16 + 13 + 3 \neq 0$$

$$w(-1) = -4 + 16 - 13 + 3 = 2 \neq 0$$

$$\begin{aligned} w(-3) &= 4 \cdot (-3)^3 + 16 \cdot (-3)^2 + 13 \cdot (-3) + 3 = -108 + 144 - 39 + 3 = \\ &= 0 \end{aligned}$$

$$\boxed{a = -3}$$

$$a \in \mathbb{C}$$

$$4x^3 + 16x^2 + 13x + 3 = 0$$

$$4x^2 + 4x + 1$$

$$(4x^3 + 16x^2 + 13x + 3) : (x + 3)$$

$$-4x^3 - 12x^2$$

$$= \frac{4x^2 + 13x + 3}{-4x^2 - 12x}$$

$$= \frac{x + 3}{-x - 3}$$

$$(4x^2 + 4x + 1)(x + 3) = 0$$

$$\Downarrow \quad \Downarrow$$

$$4x^2 + 4x + 1 = 0 \quad x + 3 = 0 \quad \boxed{x = -3}$$

$$a = -3$$

$$x - (-3)$$

$$x - a$$

$$\boxed{x + 3}$$

$$4x^2 + 4x + 1 = 0$$

$$\Delta = b^2 - 4ac = 16 - 16 = 0$$

$$x_0 = \frac{-b - \sqrt{\Delta}}{2a} = \frac{-b}{2a} = \frac{-4}{8} = -\frac{1}{2}$$

$\Delta > 0$  2.

$\Delta = 0$  1

$\Delta < 0$  0

$$x \in \left\{ -3, -\frac{1}{2} \right\}$$

$$3x^3 - x = 1 - 7x^2 \quad x = \frac{p}{q} \in W$$

$$3x^3 - x - 1 + 7x^2 = 0 \quad W(1) = 3 + 7 - 1 - 1 \neq 0$$

$$\underset{\uparrow}{3}x^3 + \underset{\uparrow}{7}x^2 - \underset{\uparrow}{x} - \underset{\uparrow}{1} = 0 \quad W(-1) = -3 + 7 + 1 - 1 \neq 0$$

$p$ -dzielniki  $a_0$

$$p = \{\pm 1\}$$

$q$ -dzielniki  $a_3$

$$q = \{\pm 1, \pm 3\}$$

$$\frac{p}{q} = \left\{ \pm 1, \pm \frac{1}{3} \right\}$$

$$\begin{aligned} W\left(\frac{1}{3}\right) &= 3 \cdot \left(\frac{1}{3}\right)^3 + 7 \cdot \left(\frac{1}{3}\right)^2 - \frac{1}{3} - 1 = 3 \cdot \frac{1}{27} + 7 \cdot \frac{1}{9} - \frac{1}{3} - 1 \\ &= \frac{1}{9} + \frac{7}{9} - \frac{3}{9} - 1 = \frac{5}{9} - 1 \neq 0 \end{aligned}$$

$$W\left(-\frac{1}{3}\right) = -\frac{1}{9} + \frac{7}{9} + \frac{3}{9} - 1 = 1 - 1 = 0$$

$$\boxed{a = -\frac{1}{3}}$$

$$3x^3 + 7x^2 - x - 1 = 0$$

|                | $x^3$ | $x^2$ | $x$ |    |
|----------------|-------|-------|-----|----|
| $-\frac{1}{3}$ | 3     | 7     | -1  | -1 |
|                |       | -1    | -2  | 1  |
|                | 3     | 6     | -3  | 0  |
|                | $x^2$ | $x$   |     |    |

$$(3x^2 + 6x - 3) \cdot \left(x + \frac{1}{3}\right) = 0$$

$$\Downarrow$$

$$3x^2 + 6x - 3 = 0 \quad | :3$$

$$\Downarrow$$

$$x = -\frac{1}{3}$$

$$r = -\frac{1}{3}$$

$$x - \left(-\frac{1}{3}\right) = x + \frac{1}{3}$$

$$\hookrightarrow x^2 + 2x - 1 = 0$$

$$\Delta = b^2 - 4ac = 4 - 4 \cdot (-1) = 8 > 0$$

$$\sqrt{\Delta} = \sqrt{8} = \sqrt{4 \cdot 2} = 2\sqrt{2}$$

$$x_1 = \frac{-b - \sqrt{\Delta}}{2a} = \frac{-2 - 2\sqrt{2}}{2} = -1 - \sqrt{2}$$

$$x_2 = \frac{-b + \sqrt{\Delta}}{2a} = \frac{-2 + 2\sqrt{2}}{2} = -1 + \sqrt{2}$$

$$x \in \left\{ -\frac{1}{3}; -1 - \sqrt{2}; -1 + \sqrt{2} \right\}$$