

**Aufgabe 3**

a)

$$(x - 3)(x^3 - 8x) = 0$$

$$(x - 3)(x^2 - 8)x = 0$$

$$x_1 = 3$$

$$x_2 = 0$$

$$x^2 - 8 = 0$$

$$x^2 = 8$$

$$x_{3,4} = \pm 2\sqrt{2}$$

b)

$$x^3 + 2x^2 - 8x = 0$$

$$x(x^2 + 2x - 8) = 0$$

$$x_1 = 0$$

$$x^2 + 2x - 8 = 0$$

$$x_{2,3} = -\frac{2}{2} \pm \sqrt{\left(\frac{2}{2}\right)^2 + 8}$$

$$= -1 \pm 3$$

$$x_2 = -1 + 3 = 2$$

$$x_3 = -1 - 3 = -4$$

c)

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

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

$$x^2 = 0$$

$$x_1 = 0$$

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

$$x_{2,3} = -\frac{4}{2} \pm \sqrt{\left(\frac{4}{2}\right)^2 - 3}$$

$$= -2 \pm 1$$

$$x_2 = -2 + 1 = -1$$

$$x_3 = -2 - 1 = -3$$

d)

$$(4x^3 - 4x)(x^2 - 5x) = 0$$

$$4x^3 - 4x = 0$$

$$x(4x^2 - 4) = 0$$

$$x_1 = 0$$

$$4x^2 - 4 = 0$$

$$4x^2 = 4$$

$$x^2 = 1$$

$$x_{2,3} = \pm 1$$

$$x^2 - 5x = 0$$

$$x(x - 5) = 0$$

$$x_4 = 0$$

$$x - 5 = 0$$

$$x_5 = 5$$

e) Tippfehler?

$$4x^2 + 5x + x^3 - 2x^2 = 0$$

$$2x^2 + 5x + x^3 = 0$$

$$x(2x + 5 + x^2) = 0$$

$$x_1 = 0$$

$$2x + 5 + x^2 = 0$$

$$x^2 + 2x + 5 = 0$$

$$\begin{aligned} x_{2,3} &= -\frac{2}{2} \pm \sqrt{\left(\frac{2}{2}\right)^2 - 5} \\ &= -1 \pm \sqrt{-4} \end{aligned}$$

Keine Lösung außer  $x_1 = 0$ .

f)

$$2x^4 - 32x^3 + 128x^2 = 0$$

$$x^2(2x^2 - 32x + 128) = 0$$

$$x^2 = 0$$

$$x_1 = 0$$

$$2x^2 - 32x + 128 = 0$$

$$x^2 - 16x + 64 = 0$$

$$\begin{aligned} x_{2,3} &= \frac{16}{2} \pm \sqrt{\left(\frac{16}{2}\right)^2 - 64} \\ &= 8 \pm 0 \\ x_2 &= 8 \end{aligned}$$

g)

$$\begin{aligned}(x^4 - 16)(2x + 1)^2 &= 0 \\ x^4 - 16 &= 0 \\ x^4 &= 16 \\ x_{1,2} &= \pm \sqrt[4]{16} = 2 \\ (2x + 1)^2 &= 0 \\ 2x + 1 &= 0 \\ 2x &= -1 \\ x_3 &= -\frac{1}{2}\end{aligned}$$

h)

$$\begin{aligned}(x^2 - 6x + 9)(x^2 + 1) &= 0 \\ x^2 - 6x + 9 &= 0 \\ x_{1,2} &= \frac{6}{2} \pm \sqrt{\left(\frac{6}{2}\right)^2 - 9} \\ &= 3 \pm 0 \\ x_1 &= 3 \\ x^2 + 1 &= 0 \\ x^2 &= -1\end{aligned}$$

Keine Lösung außer  $x_1 = 3$ .

i)

$$(x^4 - 32x^3)(4x^2 - x) = 0$$

$$x^4 - 32x^3 = 0$$

$$x^3(x - 32) = 0$$

$$x^3 = 0$$

$$x_1 = 0$$

$$x - 32 = 0$$

$$x_2 = 32$$

$$4x^2 - x = 0$$

$$x(4x - 1) = 0$$

$$x_3 = 0$$

$$4x - 1 = 0$$

$$4x = 1$$

$$x_4 = \frac{1}{4}$$