

$$b) 4x^3 - x^2 = 5x$$

$$\Leftrightarrow 4x^3 - x^2 - 5x = 0$$

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

$$\Leftrightarrow x=0 \text{ tai } 4x^2 - x - 5 = 0 \quad \Leftrightarrow x=0 \text{ tai } x = \begin{cases} \frac{5}{4} \\ -1 \end{cases}$$

16.18 luvut: $x, x+1, x+2$

$$x \cdot (x+1) \cdot (x+2) = x + (x+1) + (x+2)$$

$$\Leftrightarrow x \cdot (x^2 + 2x + x + 2) = 3x + 3$$

$$\Leftrightarrow x^3 + 3x^2 + 2x = 3x + 3$$

$$\Leftrightarrow x^3 + 3x^2 - x - 3 = 0$$

$$\Leftrightarrow x^2(x+3) - (x+3) = 0 \quad (\text{ryhmittelyperia})$$

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

$$\Leftrightarrow x+3=0 \text{ tai } x^2-1=0$$

$$\Leftrightarrow x=-3 \text{ tai } x^2=1 \quad \vee \quad \Leftrightarrow x=\pm 1$$

$$\underline{\text{Vast.}} \quad -3, -2, -1 \text{ tai } -1, 0, 1 \text{ tai } 1, 2, 3$$

TAI: luvut: $x-1, x, x+1$

$$(x-1)x(x+1) = (x-1) + x + (x+1)$$

$$\begin{array}{c} \rightarrow \quad \leftarrow \\ (x^2-1^2) \end{array}$$

$$\Leftrightarrow x(x^2-1) = 3x$$

$$\Leftrightarrow x^3 - x = 3x$$

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

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

$$\Leftrightarrow x=0 \text{ tai } x^2-4=0 \quad \Leftrightarrow x=\pm 2$$

$$\underline{\text{Vast.}} \quad -1, 0, 1 \text{ tai } -3, -2, -1 \text{ tai } 1, 2, 3$$

17. Kolmeoikeiden ja tekijöiden yhteys

Esim. $2x^2 - 8x + 6 = 0 \quad \Leftrightarrow x = \dots = \begin{cases} 3 \leftarrow 0\text{-rohdot} \\ 1 \leftarrow \end{cases}$

$$2(x-3)(x-1) = 2(x^2 - x - 3x + 3) = 2x^2 - 8x + 6$$

$\uparrow \quad \uparrow$
tekijät

Yleisesti $1^\circ D > 0 : ax^2 + bx + c = 0 \quad \Leftrightarrow x = \begin{cases} x_1 \\ x_2 \end{cases}$

$$\Rightarrow ax^2 + bx + c = a(x-x_1)(x-x_2)$$

$2^\circ D = 0 : ax^2 + bx + c = 0 \quad \Leftrightarrow x = x_1 \quad (\text{kaksoisjuuri})$

$$\Rightarrow ax^2 + bx + c = a(x-x_1)^2$$