

5.11 Jaa tekijöihin.

- a)** $12x^2 - 4x$
b) $2x^6 + x^5$
c) $9x - 15x^2$

$$\text{a) } \underbrace{12x^2}_{(3 \cdot 4 \cdot x \cdot x)} - \underbrace{4x}_{(-1) \cdot 4 \cdot x} = 4x(3x-1)$$

$$\text{b) } \underbrace{2x^6}_{2x \cdot x^5} + \underbrace{x^5}_{1 \cdot x^5} = \underline{\underline{x^5(2x+1)}}$$

$$\text{c) } \underbrace{9x}_{3 \cdot 3 \cdot x} - \underbrace{15x^2}_{3 \cdot (-5) \cdot x \cdot x} = \underline{\underline{3x(3-5x)}}$$

5.13 Jaa tekijöihin.

a) $36x^2 + 60x + 25 = (6x)^2 + 2 \cdot 6x \cdot 5 + 5^2$

b) $x^2 + 3x + \frac{9}{4} = \underline{\underline{(6x+5)^2}}$

c) $x^2 - \frac{2}{3}x + \frac{1}{9}$

$$\rightarrow = x^2 + 2 \cdot x \cdot \frac{3}{2} + \left(\frac{3}{2}\right)^2 = \left(x + \frac{3}{2}\right)^2$$

$$\text{c) } = x^2 - 2 \cdot x \cdot \frac{1}{3} + \left(\frac{1}{3}\right)^2 = \underline{\underline{\left(x - \frac{1}{3}\right)^2}}$$

5.12 Jaa tekijöihin.

- a)** $x^2 - 14x + 49$
b) $y^2 - 81$
c) $9z^2 + 12z + 4$

$$\text{a) } x^2 - 14x + 49 = \underline{\underline{(x-7)^2}}$$
$$x^2 - 2 \cdot x \cdot 7 + (-7)^2$$
$$+ 2 \cdot x \cdot (-7)$$

$$\text{b) } y^2 - 81 = \underline{\underline{(y+9)(y-9)}}$$
$$y^2 - 9^2$$

$$\text{c) } 9z^2 + 12z + 4 = \underline{\underline{(3z+2)^2}}$$
$$(3z)^2 + 2 \cdot 3z \cdot 2 + 2^2$$

5.7 Jaa tekijöihin.

- ~~CAS~~ a) $x^3 + 2x^2 - 9x - 18$
E3 b) $x^3 + x^2 - x - 1$
c) $5x^3 + x^2 - 5x - 1$

Ryhmittely:

$$\text{b) } \underbrace{x^3 + x^2}_{x^2(x+1)} - \underbrace{x - 1}_{(-1)(x+1)} = (x+1)(x^2 - 1) = (x+1)(x+1)(x-1) = (x+1)^2(x-1)$$

5.8 Jaa tekijöihin.

- ~~CAS~~ a) $x^4 - 7x^3 - 9x^2 + 63x$
b) $-3x^3 + 4x^2 + 3x - 4$
c) $9x^3 + 18x^2 - x - 2$

$$\text{a) } x^4 - 7x^3 - 9x^2 + 63x =$$

$$x \underbrace{(x^3 - 7x^2 - 9x + 63)}_{x^2(x-7) + (-9)(x-7)} = x(x-7) \underbrace{(x^2 - 9)}_{x^2 - 3^2} = \underline{\underline{x(x-7)(x+3)(x-3)}}$$

$$\text{c) } \underbrace{9x^3 + 18x^2}_{9x^2(x+2)} - \underbrace{x - 2}_{(-1)(x+2)} = (x+2) \underbrace{(9x^2 - 1)}_{(3x)^2 - 1^2} = (x+2)(3x+1)(3x-1)$$