



$$\underline{-5 \leq x \leq 5}$$

22.11

23. Koliöjuriyhtälö

Esim. a) $\sqrt{x} = 3 \quad | ()^2$

$$\Leftrightarrow (\sqrt{x})^2 = 3^2$$

$$\Leftrightarrow x = 9$$

Tark. $x=9: \sqrt{9} = 3 \quad \checkmark$

Vast. $x=9$

b) $\sqrt{x} = -3 \quad | ()^2$

$$\Leftrightarrow (\sqrt{x})^2 = (-3)^2$$

$$\Leftrightarrow x = 9$$

Tark. $x=9: \sqrt{9} = -3 \quad \downarrow$

Vast. ei ratk.

Huom. Kun yhtälö korotetaan puolittain potenssiin 2, on saatut ratkaisut tarkistettavaksi.

23.3 a) $\sqrt{2x-1} = 2x-3 \quad | ()^2$

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

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

$$\Leftrightarrow 2x-1 = 4x^2 - 12x + 9$$

$$\Leftrightarrow 0 = 4x^2 - 14x + 10 \quad \Leftrightarrow x = \begin{cases} \frac{5}{2} \\ 1 \end{cases}$$

Tark. $x = \frac{5}{2}: \sqrt{2 \cdot \frac{5}{2} - 1} = 2 \cdot \frac{5}{2} - 3 \quad \Leftrightarrow 2 = 2 \quad \checkmark$

$x = 1: \sqrt{2 \cdot 1 - 1} = 2 \cdot 1 - 3 \quad \Leftrightarrow \sqrt{1} = -1 \quad \downarrow$

Vast. $x = \frac{5}{2}$

b) $\sqrt{2-x} = x+4 \quad | ()^2$

$$\Leftrightarrow (\sqrt{2-x})^2 = (x+4)^2$$

$$\Leftrightarrow 2-x = x^2 + 2 \cdot x \cdot 4 + 4^2 \quad \Leftrightarrow 0 = x^2 + 9x + 14 \quad \Leftrightarrow x = \begin{cases} -2 \\ -7 \end{cases}$$

Tark. $x = -2: \sqrt{2 - (-2)} = -2 + 4 \quad \Leftrightarrow \sqrt{4} = 2 \quad \checkmark$

$x = -7: \sqrt{2 - (-7)} = -7 + 4 \quad \Leftrightarrow \sqrt{9} = -3 \quad \downarrow$

Vast. $x = -2$

Esim. $\sqrt{x-3} + x = 5 \quad | ()^2$

$$\Leftrightarrow (\sqrt{x-3} + x)^2 = 5^2$$

$$\Leftrightarrow (\sqrt{x-3})^2 + 2 \cdot \sqrt{x-3} \cdot x + x^2 = 25 \quad \text{pakenyi kuin algebrainen!}$$

$$\sqrt{x-3} + x = 5$$

$$\Leftrightarrow \sqrt{x-3} = 5-x \quad | ()^2$$