

← ↻ <https://cheat.abitti.fi/build/index.html?fi&math#toc-math-vrpa>

FYSIIKKA KARTAT KEMIA **MATEMATIIKKA** MUSIIKKI NÄPPÄIMISTÖ OHJELMOINTI YLEISOHJEET

Hae

Luvut ja lukujonot

Lukualueet

Lukujonot

Toisen asteen yhtälön ratkaiseminen

Toisen asteen yhtälön $ax^2 + bx + c = 0$ ratkaisut saadaan kaavalla

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

5.7
s.54

$$f(x) = -2x^2 + 5x + 3$$

a) nollakohdat $f(x) = 0$

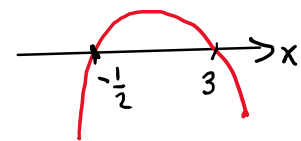
$$-2x^2 + 5x + 3 = 0$$

$a = -2$ $b = 5$ $c = 3$

$$x = \frac{-5 \pm \sqrt{5^2 - 4 \cdot (-2) \cdot 3}}{2 \cdot (-2)}$$

$$= \frac{-5 \pm \sqrt{25 + 24}}{-4}$$

$$= \frac{-5 \pm \sqrt{49}}{-4} = \frac{-5 \pm 7}{-4}$$



$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-5 + 7}{-4} = \frac{2}{-4} = -\frac{1}{2} \quad (=0,5)$$

$$x = \frac{-5 - 7}{-4} = \frac{-12}{-4} = 3$$

b) $f(x) = 6$

$$-2x^2 + 5x + 3 = 6 \quad \parallel -6$$

$$-2x^2 + 5x + 3 - 6 = 0$$

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

$$ax^2 + bx + c = 0$$

$a = -2$ $b = 5$ $c = -3$

$$x = \frac{-5 \pm \sqrt{5^2 - 4 \cdot (-2) \cdot (-3)}}{2 \cdot (-2)}$$

$$= \frac{-5 \pm \sqrt{25 - 24}}{-4} = \frac{-5 \pm \sqrt{1}}{-4} = \frac{-5 \pm 1}{-4}$$

$$x = \frac{-5 + 1}{-4} = \frac{-4}{-4} = 1 \quad \text{tai} \quad x = \frac{-5 - 1}{-4} = \frac{-6}{-4} = \frac{3}{2} \quad (=1,5)$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-5+1}{-4} = \frac{-4}{-4} = 1 \quad \text{tai} \quad x = \frac{-5-1}{-4} = \frac{-6}{-4} = \frac{3}{2} \quad (=1,5)$$

6) 2. asteen vaillinainen yhtälö

$$ax^2 + bx + c = 0$$

$b=0$

$$\underline{ax^2 + c = 0}$$

6.1
s.63

a) $x^2 = 25 \quad \parallel \sqrt{}$
 $x = \pm \sqrt{25}$
 $x = \pm 5$

$x^2 = 25 \quad \parallel -25$
 tai $x^2 - 25 = 0$

kaavalla

$a=1 \quad b=0 \quad c=-25$

$$x = \frac{-0 \pm \sqrt{0^2 - 4 \cdot 1 \cdot (-25)}}{2 \cdot 1}$$

$$= \frac{\pm \sqrt{100}}{2} = \frac{\pm 10}{2} = \pm 5$$

b) $x^2 - 10 = 0 \quad \parallel +10$

$$x^2 = 10$$

$$x = \pm \sqrt{10} \quad \text{hyvä, tarkka arvo!}$$

c) $x^2 + 1 = 0 \quad \parallel -1$

$$x^2 = -1$$

$$x = \sqrt{-1} \quad \text{ei voi!}$$

ei ratkaisua



$C=0$

$$\underline{ax^2 + bx = 0}$$

$$x(4x+8)$$

$$= 4x^2 + 8x$$

6.7

a) $4x^2 + 8x = 0$

$$x(4x+8) = 0$$

$\swarrow \quad \searrow$
 $x=0 \quad \text{tai} \quad 4x+8=0$

$$\frac{4x}{4} = -\frac{8}{4} \quad \parallel :4$$

$$x = -2$$

$\parallel$ TNS

tulon nollasääntö

tai

$$4x^2 + 8x = 0$$

$$a=4 \quad b=8 \quad c=0$$

$$x = \frac{-8 \pm \sqrt{8^2 - 4 \cdot 4 \cdot 0}}{2 \cdot 4}$$

$$= \frac{-8 \pm \sqrt{64}}{8} = \frac{-8 \pm 8}{8}$$

$$x = \frac{-8+8}{8} = 0 \quad \text{tai} \quad x = \frac{-8-8}{8} = -2$$

b) $6x^2 - x = 0$

$$b) 6x^2 - x = 0$$

$$x(6x - 1) = 0$$

$$x = 0 \quad \text{tai} \quad 6x - 1 = 0$$

$$6x = 1 \quad || :6$$

$$x = \frac{1}{6}$$

$$\begin{aligned} x &= \frac{-8 \pm \sqrt{8^2 - 4 \cdot 1 \cdot 8}}{2 \cdot 1} = \frac{-8 \pm \sqrt{64 - 32}}{2} = \frac{-8 \pm \sqrt{32}}{2} \\ x &= \frac{-8 \pm 4\sqrt{2}}{2} = -4 \pm 2\sqrt{2} \end{aligned}$$

6.5

$$a) 120x^2 = x^2 \quad || -x^2$$

$$120x^2 - x^2 = 0$$

$$119x^2 = 0 \quad || :119$$

$$x^2 = 0$$

$$x = \pm \sqrt{0}$$

$$x = 0$$

$$b) -5x^2 + 15 = 0 \quad || -15$$

$$\frac{-5x^2}{-5} = \frac{-15}{-5} \quad || :(-5)$$

$$x^2 = 3$$

$$x = \pm \sqrt{3}$$

$$c) 7x^2 - 3 + x = 4 + x \quad || -x$$

$$7x^2 - 3 + \cancel{x} - 4 - \cancel{x} = 0$$

$$7x^2 - 7 = 0 \quad || +7$$

$$7x^2 = 7 \quad || :7$$

$$x^2 = 1$$

$$x = \pm \sqrt{1}$$

$$x = \pm 1$$

tai

$$7(x^2 - 1) = 0$$

7 ≠ 0

$$x^2 - 1 = 0$$

$$x^2 = 1$$

$$x = \pm \sqrt{1} = \pm 1$$

6.7