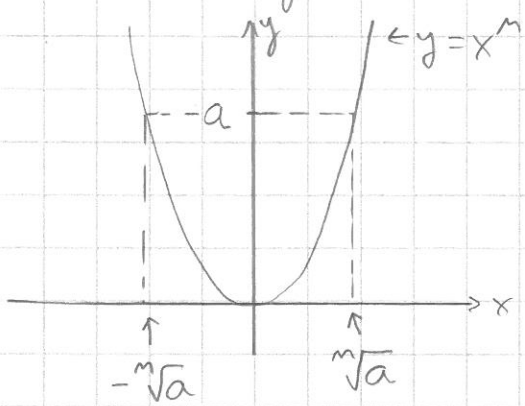
7. Korkeammat juuret

Potenssiyhtälön $x^n = a$ ratkaisu

1° $n = 2k$ parillinen

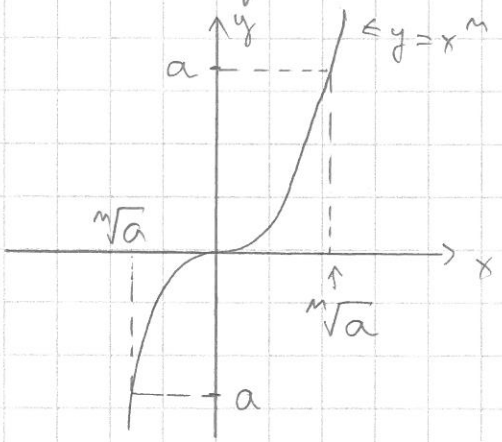


$a > 0$: $x = \pm\sqrt[n]{a}$

$a = 0$: $x = 0$

$a < 0$: ei ratk.

2° $n = 2k+1$ pariton



$x = \sqrt[n]{a}$ (aina vain 1 ratk.)

Esim. a) $2x^4 - 162 = 0 \Leftrightarrow 2x^4 = 162 \mid :2 \Leftrightarrow x^4 = 81 \mid \sqrt[4]{\ } \Leftrightarrow x = \pm\sqrt[4]{81} = \pm 3$

b) $4x^7 + 512 = 0 \Leftrightarrow 4x^7 = -512 \mid :4 \Leftrightarrow x^7 = -128 \mid \sqrt[7]{\ } \Leftrightarrow x = \sqrt[7]{-128}$

$(\sqrt[7]{-128} = -\sqrt[7]{128} = -2)$ $= -2$

c) $5x^6 + 7 = 0 \Leftrightarrow 5x^6 = -7 \mid :5$

$\Leftrightarrow \underbrace{x^6}_{\geq 0} = -\frac{7}{5}$ ei ratk.

7.16 a) $16x^4 = 32 \mid :16 \Leftrightarrow x^4 = 2 \mid \sqrt[4]{\ } \Leftrightarrow x = \pm\sqrt[4]{2}$

b) $3x^7 - 150 = 0 \Leftrightarrow 3x^7 = 150 \mid :3 \Leftrightarrow x^7 = 50 \mid \sqrt[7]{\ } \Leftrightarrow x = \sqrt[7]{50}$

c) $6x^5 + 42 = 0 \Leftrightarrow 6x^5 = -42 \mid :6 \Leftrightarrow x^5 = -7 \mid \sqrt[5]{\ }$

$\Leftrightarrow x = \sqrt[5]{-7} = -\sqrt[5]{7}$

7.10 alussa: 422

1 kk:n kuluttua: $x \cdot 422$

2 — 1, — : $x^2 \cdot 422$

⋮

6 kk — 1, — : $x^6 \cdot 422 = 211 \mid :422 \Leftrightarrow x^6 = \frac{1}{2} \mid \sqrt[6]{\ }$

$\Leftrightarrow x = \pm\sqrt[6]{\frac{1}{2}} \approx 0{,}891$

$\Rightarrow$ alenee: $1 - 0{,}891 = 0{,}109 = 10{,}9\,\%$