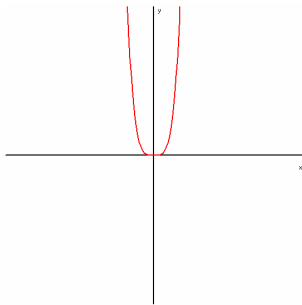


Hoofdstuk 5: Machten en exponenten.

5.1 Hogeremachtswortels

Opgave 1:

a.



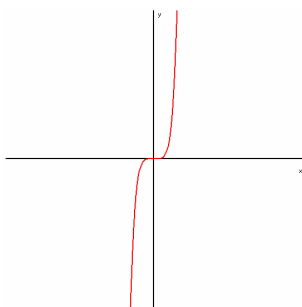
b. twee oplossingen

$$x = \sqrt[4]{30} = 2,34 \quad \vee \quad x = -\sqrt[4]{30} = -2,34$$

c. geen oplossingen

Opgave 2:

a.



b. 1 oplossing

$$x = \sqrt[5]{30} = 1,97$$

c. 1 oplossingen

$$x = \sqrt[5]{-30} = -1,97$$

Opgave 3:

a. 4

b. 2

c. -5

d. $-4 \cdot -10 = 40$

e. $3 \cdot -2 - 2 \cdot 3 = 0$

f. $3 \cdot 1 - 2 \cdot -1 = 5$

Opgave 4:

a. $x^6 = 20$

$$x = \sqrt[6]{20} \quad \vee \quad x = -\sqrt[6]{20}$$

b. $5x^3 = 135$

$$x^3 = 27$$

$$x = \sqrt[3]{27} = 3$$

- c. $0,5x^5 = 20$
 $x^5 = 40$
 $x = \sqrt[5]{40}$
- d. $x^4 + 7 = 88$
 $x^4 = 81$
 $x = \sqrt[4]{81} = 3 \quad \vee \quad x = -\sqrt[4]{81} = -3$
- e. $3x^5 - 1 = 95$
 $3x^5 = 96$
 $x^5 = 32$
 $x = \sqrt[5]{32} = 2$
- f. $\frac{1}{4}x^8 + 3 = 10$
 $\frac{1}{4}x^8 = 7$
 $x^8 = 28$
 $x = \sqrt[8]{28} \quad \vee \quad x = -\sqrt[8]{28}$

Opgave 5:

- a. $3x^5 + 7 = 15$
 $3x^5 = 8$
 $x^5 = \frac{8}{3}$
 $x = \sqrt[5]{\frac{8}{3}} = 1,22$
- b. $\frac{1}{3}x^7 = 720$
 $x^7 = 2160$
 $x = \sqrt[7]{2160} = 2,99$
- c. $0,7x^4 - 1,3 = 2$
 $0,7x^4 = 3,3$
 $x^4 = 4,71$
 $x = \sqrt[4]{4,71} = 1,47 \quad \vee \quad x = -\sqrt[4]{4,71} = -1,47$

Opgave 6:

- a. $5x^4 - 1 = 4$
 $5x^4 = 5$
 $x^4 = 1$
 $x = 1 \quad \vee \quad x = -1$
- b. $5x^4 = -4$
 $x^4 = -0,8$
 geen oplossingen
- c. $5x^3 - 1 = 5$
 $5x^3 = 6$
 $x^3 = 1,2$
 $x = \sqrt[3]{1,2} = 1,06$

- d. $8x^3 + 2 = 1$
 $8x^3 = -1$
 $x^3 = -0,125$
 $x = \sqrt[3]{-0,125} = -0,5$
- e. $5x^6 + 7 = 98$
 $5x^6 = 91$
 $x^6 = 18,2$
 $x = \sqrt[6]{18,2} = 1,62 \quad \vee \quad x = -\sqrt[6]{18,2} = -1,62$
- f. $0,1x^7 - 1 = 999$
 $0,1x^7 = 1000$
 $x^7 = 10000$
 $x = \sqrt[7]{100000} = 3,73$

Opgave 7:

- a. $G = 0,4 \cdot 6,3^3 = 100 \text{ g}$
- b. $0,4d^3 = 65$
 $d^3 = 162,5$
 $d = \sqrt[3]{162,5} = 5,5 \text{ cm}$
- c. vanwege d^3 is het gewicht dan $2^3 = 8 \times$ zo groot
- d. $d^3 = 2$
 $d = \sqrt[3]{2} = 1,26$ dus de diameter is $1,26 \times$ zo groot

Opgave 8:

- a. $D = 0,0285 \cdot 300 \cdot 0,4^3 = 0,5472 = 5 \text{ mm}$
- b. $0,285 \cdot 250 \cdot L^3 = 1,2$
 $L^3 = 0,168$
 $L = \sqrt[3]{0,168} = 0,256 \text{ m} = 26 \text{ cm}$
- c. $0,285 \cdot 300 \cdot L^3 = 2,5$
 $L^3 = 0,029$
 $L = \sqrt[3]{0,029} = 0,308 \text{ m} = 30 \text{ cm}$
- d. vanwege L^3 is de doorbuiging $2^3 = 8 \times$ zo sterk

Opgave 9:

- a. $a \cdot 5^4 = 13,5$
 $a = 0,0216$
- b. $W = 0,02 \cdot 8^4 = 81,92 \text{ } \frac{1}{s} = 4915,2 \text{ } \frac{1}{\text{min}}$
- c. $16650 : 60 = 277,5 \text{ } \frac{1}{s}$
 $0,02d^4 = 277,5$
 $d^4 = 13875$
 $d = \sqrt[4]{13875} = 10,9 \text{ cm}$

Opgave 10:

$$\left(\sqrt[3]{8}\right)^3 = 8$$

$$\left(\sqrt[4]{81}\right)^4 = 81$$

$$\left(\sqrt[5]{32}\right)^5 = 32$$

$$\left(\sqrt[3]{1000}\right)^3 = 1000$$

Opgave 11:

a. $x^4 = 6$

$$x = \sqrt[4]{6} \quad \vee \quad x = -\sqrt[4]{6}$$

b. $\sqrt[4]{x} = 6$

$$x = 6^4 = 1296$$

c. $\sqrt[5]{x} = 2$

$$x = 2^5 = 32$$

d. $3x^5 - 1 = 20$

$$3x^5 = 21$$

$$x^5 = 7$$

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

e. $3 \cdot \sqrt[4]{x} + 2 = 14$

$$3 \cdot \sqrt[4]{x} = 12$$

$$\sqrt[4]{x} = 4$$

$$x = 4^4 = 256$$

f. $0,2x^7 + 8 = 26$

$$0,2x^7 = 18$$

$$x^7 = 90$$

$$x = \sqrt[7]{90}$$

g. $0,1\sqrt{x} + 2 = 12$

$$0,1\sqrt{x} = 10$$

$$\sqrt{x} = 100$$

$$x = 10000$$

h. $5 - 2 \cdot \sqrt[3]{x} = 3$

$$-2 \cdot \sqrt[3]{x} = -2$$

$$\sqrt[3]{x} = 1$$

$$x = 1$$

i. $3 \cdot \sqrt[5]{x} - 1 = 20$

$$3 \cdot \sqrt[5]{x} = 21$$

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

$$x = 7^5 = 16807$$

Opgave 12:

a. $y = x^5$

$$x = \sqrt[5]{y}$$

b. $y = 2x^5 + 4$

$$2x^5 = y - 4$$

$$x^5 = \frac{1}{2}y - 2$$

$$x = \sqrt[5]{\frac{1}{2}y - 2}$$

c. $y = \sqrt[7]{x}$

$$x = y^7$$

d. $y = 2 \cdot \sqrt[3]{x} + 8$

$$2 \cdot \sqrt[3]{x} = y - 8$$

$$\sqrt[3]{x} = \frac{1}{2}y - 4$$

$$x = \left(\frac{1}{2}y - 4\right)^3$$

e. $y = 0,1x^5 - 6$

$$0,1x^5 = y + 6$$

$$x^5 = 10y + 60$$

$$x = \sqrt[5]{10y + 60}$$

f. $y = 0,1 \cdot \sqrt[5]{x} - 6$

$$0,1 \cdot \sqrt[5]{x} = y + 6$$

$$\sqrt[5]{x} = 10y + 60$$

$$x = (10y + 60)^5$$

Opgave 13:

a. $0,2 \cdot \sqrt[3]{x} = 4$

$$\sqrt[3]{x} = 20$$

$$x = 20^3 = 8000$$

b. $9 + \sqrt[5]{x} = 13$

$$\sqrt[5]{x} = 4$$

$$x = 4^5 = 1024$$

c. $3 + 2 \cdot \sqrt[3]{x} = 9$

$$2 \cdot \sqrt[3]{x} = 6$$

$$\sqrt[3]{x} = 3$$

$$x = 3^3 = 27$$

d. $5 - 2 \cdot \sqrt[5]{x} = 4$

$$-2 \cdot \sqrt[5]{x} = -1$$

$$\sqrt[5]{x} = 0,5$$

$$x = 0,5^5 = 0,03125$$

e. $3x^6 - 1 = 23$

$$3x^6 = 24$$

$$x^6 = 8$$

$$x = \sqrt[6]{8} \quad \vee \quad x = -\sqrt[6]{8}$$

f. $3 \cdot \sqrt[6]{x} - 1 = 23$

$$3 \cdot \sqrt[6]{x} = 24$$

$$\sqrt[6]{x} = 8$$

$$x = 8^6 = 262144$$

Opgave 14:

a. $y = 0,5 \cdot \sqrt[3]{x} - 8$

$$0,5 \cdot \sqrt[3]{x} = y + 8$$

$$\sqrt[3]{x} = 2y + 16$$

$$x = (2y + 16)^3$$

b. $y = 0,5x^7 - 8$

$$0,5x^7 = y + 8$$

$$x^7 = 2y + 16$$

$$x = \sqrt[7]{2y + 16}$$

c. $y = \sqrt[3]{x+6}$

$$x + 6 = y^3$$

$$x = y^3 - 6$$

d. $y = 2 \cdot \sqrt[5]{x} + 3$

$$2 \cdot \sqrt[5]{x} = y - 3$$

$$\sqrt[5]{x} = \frac{1}{2}y - 1\frac{1}{2}$$

$$x = \left(\frac{1}{2}y - 1\frac{1}{2}\right)^5$$

e. $y = 0,2 \cdot \sqrt[5]{2x-3}$

$$\sqrt[5]{2x-3} = 5y$$

$$2x - 3 = (5y)^5$$

$$2x - 3 = 3125y^5$$

$$2x = 3125y^5 + 3$$

$$x = 1562,5x^5 + 1,5$$

f. $y = 0,2x^5 - 3$

$$0,2x^5 = y + 3$$

$$x^5 = 5y + 15$$

$$x = \sqrt[5]{5y + 15}$$

Opgave 15:

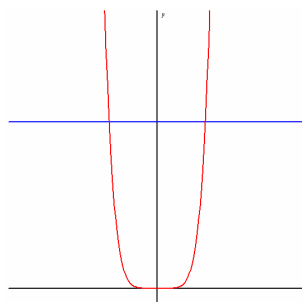
a. $x^6 < 18$

$$x = \sqrt[6]{18} \quad \vee \quad x = -\sqrt[6]{18}$$

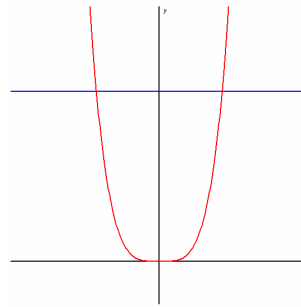
$$-\sqrt[6]{18} < x < \sqrt[6]{18}$$

b. $x^6 \geq 18$

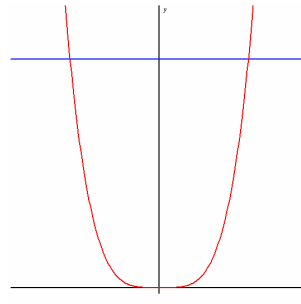
$$x \leq -\sqrt[6]{18} \quad \vee \quad x \geq \sqrt[6]{18}$$



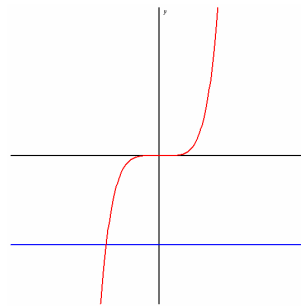
c. $2x^4 > 40$
 $x^4 > 20$
 $x = \sqrt[4]{20} \vee x = -\sqrt[4]{20}$
 $x < -\sqrt[4]{20} \vee x > \sqrt[4]{20}$



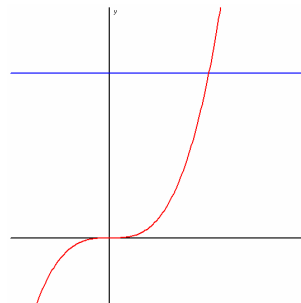
d. $5x^4 \leq 405$
 $x^4 = 81$
 $x = \sqrt[4]{81} = 3 \vee x = -\sqrt[4]{81} = -3$
 $-3 \leq x \leq 3$



e. $x^5 \geq -18$
 $x = \sqrt[5]{-18}$
 $x \geq \sqrt[5]{-18}$

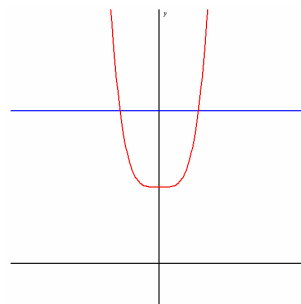


f. $4x^3 \leq 500$
 $x^3 = 125$
 $x = \sqrt[3]{125} = 5$
 $x \leq 5$

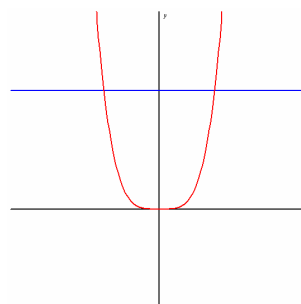


Opgave 16:

a. $3x^4 + 9 > 18$
 $3x^4 = 9$
 $x^4 = 3$
 $x = \sqrt[4]{3} \vee x = -\sqrt[4]{3}$
 $x < -\sqrt[4]{3} \vee x > \sqrt[4]{3}$



b. $0,5x^4 \leq 6$
 $x^4 = 12$
 $x = \sqrt[4]{12} \vee x = -\sqrt[4]{12}$
 $-\sqrt[4]{12} \leq x \leq \sqrt[4]{12}$

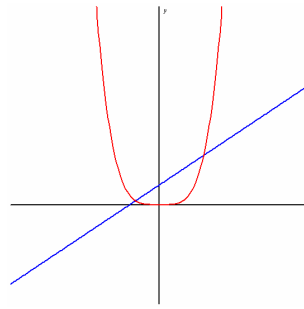


c. $0,5x^4 > x + 6$

$y_1 = 0,5x^4$ en $y_2 = x + 6$

intersect geeft: $x = -1,71$ ∨ $x = 2$

$x < -1,71$ ∨ $x > 2$



d. $-5a^3 + 7 > -8$

$y_1 = -5x^3 + 7$ en $y_2 = -8$

intersect geeft $x = 1,44$

$x < 1,44$

