Hoofdstuk 3: Vergelijkingen en ongelijkheden

3.1 Kwadratische vergelijkingen

Opgave 1:

a. $2x-3=5$
$2x=8$
$x=4$

b. $2x-3=5x$
$-3x=3$
$x=-1$

c. $x(2x-3)=0$
$x=0 \vee 2x=3$
$x=0 \quad \vee \quad x=1\frac{1}{2}$

d. $x^2=9$
$x=3 \quad \vee \quad x=-3$

e. $x^2-2x=0$
$x(x-2)=0$
$x=0 \quad \vee \quad x=2$

f. $x^2-2x=3$
$x^2-2x-3=0$
$(x-3)(x+1)=0$
$x=3 \quad \vee \quad x=-1$

Opgave 2:

a. $x^2-5x=5$
$x^2-5x-5=0$
$x=\dfrac{5\pm\sqrt{45}}{2}$
$x=\dfrac{5+\sqrt{45}}{2} \quad \vee \quad x=\dfrac{5-\sqrt{45}}{2}$

b. $x(x-1)=12$
$x^2-x-12=0$
$(x-4)(x+3)=0$
$x=4 \quad \vee \quad x=-3$

c. $2x^2=5x$
$2x^2-5x=0$
$x(2x-5)=0$
$x=0 \quad \vee \quad 2x=5$
$x=0 \quad \vee \quad x=2\frac{1}{2}$

d. $x^2=x+1$
$x^2-x-1=0$
$x=\dfrac{1\pm\sqrt{5}}{2}$

$x = \frac{1+\sqrt{5}}{2} \quad \vee \quad x = \frac{1-\sqrt{5}}{2}$

e. $x^2 = 11$

$x = \sqrt{11} \quad \vee \quad x = -\sqrt{11}$

f. $x^2 + 4 = x$

$x^2 - x + 4 = 0$

$x = \frac{1 \pm \sqrt{-15}}{2}$ = k.n. dus geen oplossingen

Opgave 3:

a. $3x^2 - 6x = 24$

$3x^2 - 6x - 24 = 0$

$x^2 - 2x - 8 = 0$

$(x-4)(x+2) = 0$

$x = 4 \quad \vee \quad x = -2$

b. $3x^2 - 6x = -3(x-6)$

$3x^2 - 6x = -3x + 18$

$3x^2 - 3x - 18 = 0$

$x^2 - x - 6 = 0$

$(x-3)(x+2) = 0$

$x = 3 \quad \vee \quad x = -2$

c. $2x^2 - 3x = 2$

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

$x = \frac{3 \pm \sqrt{25}}{4} = \frac{3 \pm 5}{4}$

$x = \frac{3+5}{4} = 2 \quad \vee \quad x = \frac{3-5}{4} = -\frac{1}{2}$

d. $x^2 - 2x - 6 = 0$

$x = \frac{2 \pm \sqrt{28}}{2}$

$x = \frac{2+\sqrt{28}}{2} \quad \vee \quad x = \frac{2-\sqrt{28}}{2}$

e. $x^2 - 3x = 5(x-3)$

$x^2 - 3x = 5x - 15$

$x^2 - 8x + 15 = 0$

$(x-3)(x-5) = 0$

$x = 3 \quad \vee \quad x = 5$

f. $2x^2 - 5x = x$

$2x^2 - 6x = 0$

$2x(x-3) = 0$

$x = 0 \quad \vee \quad x = 3$

Opgave 4:

a. $(2x+1)^2 = 4x+5$

$4x^2 + 4x + 1 = 4x + 5$

$4x^2 = 4$

$x^2 = 1$

$x = 1 \quad \vee \quad x = -1$

b. $(x+3)^2 + (x+2)^2 = 25$

$x^2 + 6x + 9 + x^2 + 4x + 4 = 25$

$2x^2 + 10x - 12 = 0$

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

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

$x = -6 \quad \vee \quad x = 1$

c. $3(x-2)^2 = 2x+1$

$3(x^2 - 4x + 4) = 2x + 1$

$3x^2 - 12x + 12 = 2x + 1$

$3x^2 - 14x + 11 = 0$

$x = \dfrac{14 \pm \sqrt{64}}{6} = \dfrac{14 \pm 8}{6}$

$x = \dfrac{14+8}{6} = 3\frac{2}{3} \quad \vee \quad x = \dfrac{14-8}{6} = 1$

d. $x^2 - (x+1)^2 = (x+3)^2$

$x^2 - (x^2 + 2x + 1) = x^2 + 6x + 9$

$x^2 - x^2 - 2x - 1 = x^2 + 6x + 9$

$-x^2 - 8x - 10 = 0$

$x^2 + 8x + 10 = 0$

$x = \dfrac{-8 \pm \sqrt{24}}{2}$

$x = \dfrac{-8 + \sqrt{24}}{2} \quad \vee \quad x = \dfrac{-8 - \sqrt{24}}{2}$

Opgave 5:

a. $x^2 - 5x = 0$

$x(x-5) = 0$

$x = 0 \quad \vee \quad x = 5$

b. $x^2 - 5x = 14$

$x^2 - 5x - 14 = 0$

$(x-7)(x+2) = 0$

$x = 7 \quad \vee \quad x = -2$

c. $x^2 + 5 = 14$

$x^2 = 9$

$x = 3 \quad \vee \quad x = -3$

d. $(3x-1)(2x+3) = 0$

$3x = 1 \quad \vee \quad 2x = -3$

$x = \frac{1}{3} \quad \vee \quad x = -1\frac{1}{2}$

e. $(3x-1)(2x+3) = -3$

$6x^2 + 7x - 3 = -3$

$6x^2 + 7x = 0$

$x(6x+7) = 0$

$x = 0 \quad \vee \quad 6x = -7$

$x = 0 \quad \vee \quad x = -1\frac{1}{6}$

f. $(x+3)^2 = 16x$

$x^2 + 6x + 9 = 16x$

$x^2 - 10x + 9 = 0$

$(x-1)(x-9) = 0$

$x = 1 \quad \vee \quad x = 9$

g. $(2x+3)^2 = -16$

geen oplossingen want een kwadraat kan nooit negatief zijn

h. $(x+3)(x-3) = 8x$

$x^2 - 9 = 8x$

$x^2 - 8x - 9 = 0$

$(x-9)(x+1) = 0$

$x = 9 \quad \vee \quad x = -1$

Opgave 6:

Alleen vergelijking b, want dat is een tweedegraads vergelijking.

Opgave 7:

a. $2x^2 - 3x - 4 = 0$

$x = \frac{3 \pm \sqrt{41}}{4}$

$x = \frac{3+\sqrt{41}}{4} \quad \vee \quad x = \frac{3-\sqrt{41}}{4}$

b. $\frac{3+\sqrt{41}}{4} + \frac{3-\sqrt{41}}{4} = \frac{6}{4} = 1\frac{1}{2}$

c. $\frac{3+\sqrt{41}}{4} \cdot \frac{3-\sqrt{41}}{4} = \frac{9-41}{16} = -2$

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

$x = \frac{-b+\sqrt{b^2-4ac}}{2a} \quad \vee \quad x = \frac{-b-\sqrt{b^2-4ac}}{2a}$

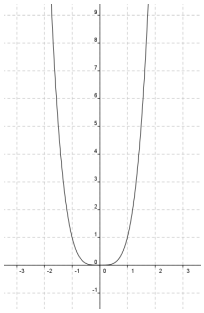
$\frac{-b+\sqrt{b^2-4ac}}{2a} + \frac{-b-\sqrt{b^2-4ac}}{2a} = \frac{-2b}{2a} = -\frac{b}{a}$

e. $\frac{-b+\sqrt{b^2-4ac}}{2a} \cdot \frac{-b-\sqrt{b^2-4ac}}{2a} = \frac{b^2-(b^2-4ac)}{4a^2} = \frac{b^2-b^2+4ac}{4a^2} = \frac{4ac}{4a^2} = \frac{c}{a}$

f. $som = -\frac{b}{a} = -\frac{4}{3}$ en $product = \frac{c}{a} = -\frac{5}{3}$

3.2 Hogeregraads vergelijkingen

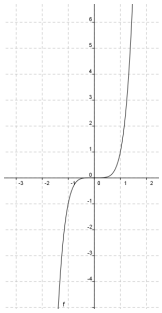
Opgave 8:

a. 

b. 2 oplossingen
neem $y_1 = x^4$ en $y_2 = 40$ intersect geeft $x = 2{,}51 \quad \vee \quad x = -2{,}51$

c. geen oplossingen

Opgave 9:

a. 

b. 1 oplossing, want iedere horizontale lijn heeft 1 snijpunt met de grafiek

c. 1 oplossing

Opgave 10:

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

b. $5x^3 = 100$
$x^3 = 20$
$x = \sqrt[3]{20}$

c. $x^2 + 7 = 18$
$x^2 = 11$
$x = \sqrt{11} \quad \vee \quad x = -\sqrt{11}$

d. $3x^7 + 25 = 4$
$3x^7 = -21$
$x^7 = -7$
$x = \sqrt[7]{-7}$

e. $\frac{1}{2}x^6 + 12 = 9$
$\frac{1}{2}x^6 = -3$
$x^6 = -6$
geen oplossingen

f. $0{,}3x^8 + 5 = 11$

$0{,}3x^8 = 6$

$x^8 = 20$

$x = \sqrt[8]{20} \quad \vee \quad x = -\sqrt[8]{20}$

Opgave 11:

a. $3x^5 + 10 = 16$

$3x^5 = 6$

$x^5 = 2$

$x = \sqrt[5]{2} = 1{,}15$

b. $2x^5 + 9 = 1$

$2x^5 = -8$

$x^5 = -4$

$x = \sqrt[5]{-4} = -1{,}32$

c. $3x^4 - 5 = 10$

$3x^4 = 15$

$x^4 = 5$

$x = \sqrt[4]{5} = 1{,}50 \quad \vee \quad x = -\sqrt[4]{5} = -1{,}50$

d. $3x^4 + 10 = 4$

$3x^4 = -6$

$x^4 = -2$

geen oplossingen

e. $\frac{1}{3}x^6 + 2 = 6$

$\frac{1}{3}x^6 = 4$

$x^6 = 12$

$x = \sqrt[6]{12} = 1{,}51 \quad \vee \quad x = -\sqrt[6]{12} = -1{,}51$

f. $-\frac{1}{2}x^6 + 6 = 2$

$-\frac{1}{2}x^6 = -4$

$x^6 = 8$

$x = \sqrt[6]{8} = 1{,}41 \quad \vee \quad x = -\sqrt[6]{8} = -1{,}41$

Opgave 12:

a. $4^3 = 64$ dus $\sqrt[3]{64} = 4$

b. $x = \sqrt[3]{125} = 5$

c.

x	1	2	3	4	5	6	7	8	9
x^2	1	4	9	16	25	36	49	64	81
x^3	1	8	27	64	125	216	343		
x^4	1	16	81	256	625				
x^5	1	32	343	1024					
x^6	1	64	729						

Opgave 13:

a. $0{,}5x^3 - 8 = 100$

$0{,}5x^3 = 108$

$x^3 = 216$

$x = 6$

b. $\frac{1}{9}x^6 - 1 = 80$

$\frac{1}{9}x^6 = 81$

$x^6 = 729$

$x = 3 \quad \vee \quad x = -3$

c. $82 - \frac{1}{3}x^5 = 1$

$-\frac{1}{3}x^5 = -81$

$x^5 = 243$

$x = 3$

d. $3(2x-1)^2 = 147$

$(2x-1)^2 = 49$

$2x - 1 = 7 \quad \vee \quad 2x - 1 = -7$

$2x = 8 \quad \vee \quad 2x = -6$

$x = 4 \quad \vee \quad x = -3$

e. $5(x+2)^3 - 36 = 99$

$5(x+2)^3 = 135$

$(x+2)^3 = 27$

$x + 2 = 3$

$x = 1$

f. $0{,}2(4x+1)^4 - 25 = 100$

$0{,}2(4x+1)^4 = 125$

$(4x+1)^4 = 625$

$4x + 1 = 5 \quad \vee \quad 4x + 1 = -5$

$4x = 4 \quad \vee \quad 4x = -6$

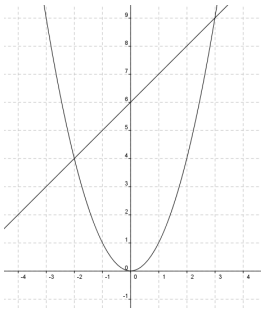
$x = 1 \quad \vee \quad x = -1\frac{1}{2}$

3.3 Vergelijkingen grafisch-numeriek oplossen

Opgave 14:

a.

x	-3	-2	-1	0	1	2	3
x^2	9	4	1	0	1	4	9
$x+6$	3	4	5	6	7	8	9



b. de oplossingen van de vergelijking zijn de x-coördinaten van de snijpunten van de twee grafieken
$x = -2 \quad \vee \quad x = 3$

Opgave 15:

a. $y_1 = x^3 - 5x - 2$
optie zero geeft: $x = -2 \quad \vee \quad x = -0{,}414 \quad \vee \quad x = 2{,}414$

b. $y_1 = -0{,}5x^3 + 2x^2 - 2$
optie zero geeft: $x = -0{,}903 \quad \vee \quad x = 1{,}194 \quad \vee \quad x = 3{,}709$

c. $y_1 = -x^3 + 6x \quad y_2 = 0{,}4x^2 + 2$
optie intersect: $x = -2{,}799 \quad \vee \quad x = 0{,}348 \quad \vee \quad x = 2{,}050$

d. $y_1 = x^3 - 3 \quad y_2 = 0{,}5x^2 - 2x$
optie intersect: $x = 1{,}116$

Opgave 16:

a. $y_1 = 0{,}2x^3 - 3x + 2$
optie zero: $x = -4{,}17 \quad \vee \quad x = 0{,}69 \quad \vee \quad x = 3{,}48$

b. $y_1 = -0{,}4x^4 + 2x^3 - 8x + 5$
optie zero: $x = -1{,}95 \quad \vee \quad x = 0{,}70 \quad \vee \quad x = 2{,}36 \quad \vee \quad x = 3{,}89$

Opgave 17:

a. $x^3 - 5x - 2 = 0$
$x^3 = 5x + 2$
$y_1 = x^3 \quad y_2 = 5x + 2$

b. $x^3 - 3 = 0{,}5x^2 - 2x$
$x^3 - 0{,}5x^2 + 2x - 3 = 0$
$y_1 = x^3 - 0{,}5x^2 + 2x - 3$

c. ja, je moet dan de vergelijking op 0 herleiden

Opgave 18:

a. $5x^2 = 15$
$x^2 = 3$
$x = \sqrt{3} \quad \vee \quad x = -\sqrt{3}$

b. $y_1 = 5x^2 \quad y_2 = 15$
optie intersect: $x = -1{,}73 \quad \vee \quad x = 1{,}73$

Opgave 19:

a. $(2x+3)(3x-2)=0$

$2x=-3 \quad \vee \quad 3x=2$

$x=-1\frac{1}{2} \quad \vee \quad x=\frac{2}{3}$

b. $(2x+3)(3x-2)=5$

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

$6x^2+5x-11=0$

$x=\dfrac{-5\pm\sqrt{289}}{12}=\dfrac{-5\pm17}{12}$

$x=\dfrac{-5+17}{12}=1 \quad \vee \quad x=\dfrac{-5-17}{12}=-1\frac{5}{6}$

c. $2x^2+7x=1$

$2x^2+7x-1=0$

$x=\dfrac{-7\pm\sqrt{57}}{4}$

$x=\dfrac{-7+\sqrt{57}}{4} \quad \vee \quad x=\dfrac{-7-\sqrt{57}}{4}$

d. $2x^2+7x=-5$

$2x^2+7x+5=0$

$x=\dfrac{-7\pm\sqrt{9}}{4}=\dfrac{-7\pm3}{4}$

$x=\dfrac{-7+3}{4}=-1 \quad \vee \quad x=\dfrac{-7-3}{4}=-2\frac{1}{2}$

Opgave 20:

a. $y_1=2x^2+7x \quad y_2=5$

optie intersect: $x=-4{,}108 \quad \vee \quad x=0{,}608$

b. $y_1=0{,}5x^2-7x \quad y_2=5$

optie intersect: $x=-0{,}681 \quad \vee \quad x=14{,}681$

c. $y_1=100x^2 \quad y_2=2500$

optie intersect: $x=5 \quad \vee \quad x=-5$

d. $y_1=x^2-10x \quad y_2=100$

optie intersect: $x=-6{,}180 \quad \vee \quad x=16{,}180$

Opgave 21:

$0{,}01v^2=30$

$v^2=3000$

$v=\sqrt{3000}=54{,}8\ ^{km}/_{uur}$

3.4 Ongelijkheden oplossen

Opgave 22:

a. $x^2 + 4 < 5x$

links en rechts $5x$ afhalen geeft

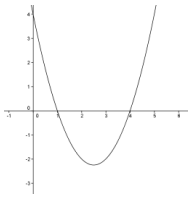
$x^2 - 5x + 4 < 0$

b. $x^2 - 5x + 4 = 0$

$(x-1)(x-4) = 0$

$x = 1 \quad \vee \quad x = 4$

$1 < x < 4$



c. $1 < x < 4$

Opgave 23:

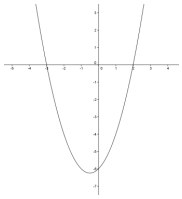
a. $x^2 + x > 6$

$x^2 + x - 6 > 0$

$(x+3)(x-2) = 0$

$x = -3 \quad \vee \quad x = 2$

$x < -3 \quad \vee \quad x > 2$



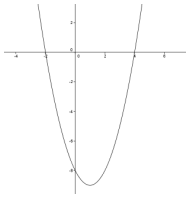
b. $x^2 < 2x + 8$

$x^2 - 2x - 8 < 0$

$(x-4)(x+2) = 0$

$x = 4 \quad \vee \quad x = -2$

$-2 < x < 4$



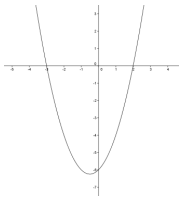
c. $2x^2 + x - 10 > x^2 - 4$

$x^2 + x - 6 > 0$

$(x+3)(x-2) = 0$

$x = -3 \quad \vee \quad x = 2$

$x < -3 \quad \vee \quad x > 2$



d. $2x^2 + 7 < 3 - x^2$

$3x^2 + 4 < 0$

$3x^2 < -4$

geen oplossingen want $3x^2$ is voor iedere x groter of gelijk aan 0

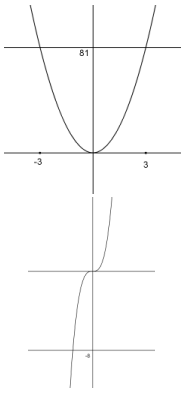
Opgave 24:

a. $x^4 > 81$

$x^4 = 81$

$x = \sqrt[4]{81} = 3 \quad \vee \quad x = -\sqrt[4]{81} = -3$

$x < -3 \quad \vee \quad x > 3$



b. $x^3 < -8$

$x^3 = -8$

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

$x < -2$

c. $\frac{1}{2}x^4 + 1 < 9$

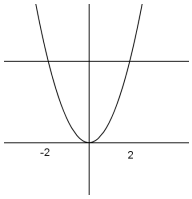
$\frac{1}{2}x^4 < 8$

$x^4 < 16$

$x^4 = 16$

$x = \sqrt[4]{16} = 2 \quad \vee \quad x = -\sqrt[4]{16} = -2$

$-2 < x < 2$



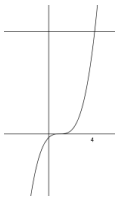
d. $\frac{1}{3}(x-1)^3 > 9$

$(x-1)^3 > 27$

$x - 1 = \sqrt[3]{27} = 3$

$x = 4$

$x > 4$

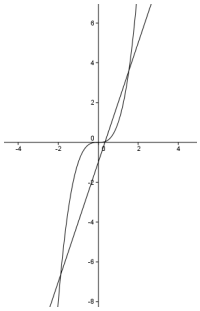


Opgave 25:

a. $y_1 = x^3 \quad y_2 = 3x - 1$

intersect geeft: $x = -1{,}88 \quad \vee \quad x = 0{,}35 \quad \vee \quad x = 1{,}53$

b. $x < -1{,}88 \quad \vee \quad 0{,}35 < x < 1{,}53$

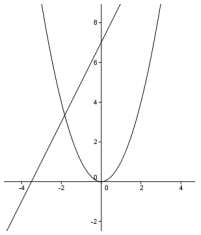


Opgave 26:

a. $y_1 = x^2 \quad y_2 = 2x + 7$

intersect geeft: $x = -1{,}83 \quad \vee \quad x = 3{,}83$

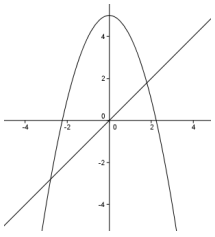
$-1{,}83 < x < 3{,}83$



b. $y_1 = 5 - x^2 \quad y_2 = x$

intersect geeft: $x = -2{,}79 \quad \vee \quad x = 1{,}79$

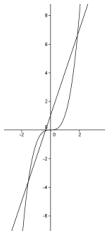
$x < -2{,}79 \quad \vee \quad x > 1{,}79$



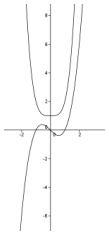
c. $y_1 = x^3 \quad y_2 = 3x + 1$

intersect geeft: $x = -1{,}53 \quad \vee \quad x = -0{,}35 \quad \vee \quad x = 1{,}88$

$-1{,}53 < x < -0{,}35 \quad \vee \quad x > 1{,}88$

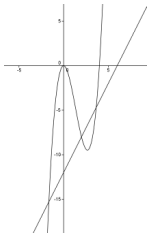


d. $y_1 = x^4 + 1 \quad y_2 = x^3 - x$
geen snijpunten
dus iedere x is een oplossing

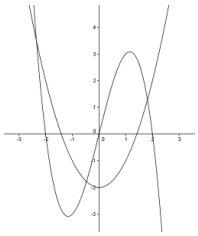


Opgave 27:

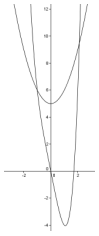
a. $y_1 = x^3 - 4x^2 \quad y_2 = 2x - 12$
intersect geeft: $x = -1{,}65 \quad \vee \quad x = 2 \quad \vee \quad x = 3{,}65$
$x < -1{,}65 \quad \vee \quad 2 < x < 3{,}65$



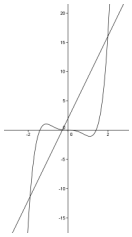
b. $y_1 = 4x - x^3 \quad y_2 = x^2 - 2$
intersect geeft: $x = -2{,}34 \quad \vee \quad x = -0{,}47 \quad \vee \quad x = 1{,}81$
$x < -2{,}34 \quad \vee \quad -0{,}47 < x < 1{,}81$



c. $y_1 = x^4 - 5x \quad y_2 = x^2 + 5$
intersect geeft: $x = -1 \quad \vee \quad x = 2{,}12$
$-1 < x < 2{,}12$

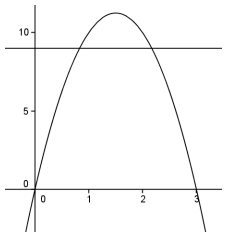


d. $y_1 = x^5 - 2x^3 \quad y_2 = 7x + 2$
intersect geeft: $x = -1{,}91 \quad \vee \quad x = -0{,}28 \quad \vee \quad x = 2$
$-1{,}91 < x < -0{,}28 \quad \vee \quad x > 2$



Opgave 28:

$y_1 = -5x^2 + 15x \quad y_2 = 9$
intersect geeft: $x = 0{,}83 \quad \vee \quad x = 2{,}17$
dus $\Delta t = 2{,}17 - 0{,}83 = 1{,}3$ sec



Opgave 29:

$y_1 = -0{,}12x^2 + 3{,}98 \quad y_2 = 3{,}7$
intersect geeft: $x = 1{,}528 \quad \vee \quad x = -1{,}528$
dus maximaal: $2 \cdot 1{,}528 = 3{,}05$ m (3,06 m is te breed)

3.5 Diagnostische toets

Opgave 1:

a. $5(x-3)-2x=-3(2x-4)$
$5x-15-2x=-6x+12$
$9x=27$
$x=3$

b. $3x^2-9=18$
$3x^2=27$
$x^2=9$
$x=3 \quad \vee \quad x=-3$

c. $x^2+12x=28$
$x^2+12x-28=0$
$(x+14)(x-2)=0$
$x=-14 \quad \vee \quad x=2$

d. $(2x-5)(4-x)=0$
$2x=5 \quad \vee \quad 4=x$
$x=2\frac{1}{2} \quad \vee \quad x=4$

e. $5x^2+6x+1=0$
$x=\dfrac{-6\pm\sqrt{16}}{10}=\dfrac{-6\pm4}{10}$
$x=\dfrac{-6+4}{10}=-\frac{1}{5} \quad \vee \quad x=\dfrac{-6-4}{10}=-1$

f. $6x^2+27x=0$
$6x(x+4\frac{1}{2})=0$
$x=0 \quad \vee \quad x=-4\frac{1}{2}$

Opgave 2:

a. $x^8=256$
$x=\sqrt[8]{256}=2 \quad \vee \quad x=-\sqrt[8]{256}=-2$

b. $x^3=-216$
$x=\sqrt[3]{-216}=-6$

c. $4x^4+8=7$
$4x^4=-1$
geen oplossingen

d. $5-x^5=-4$
$-x^5=-9$
$x^5=9$
$x=\sqrt[5]{9}$

e. $9(x-1)^4=144$
$(x-1)^4=16$
$x-1=\sqrt[4]{16}=2 \quad \vee \quad x-1=-\sqrt[4]{16}=-2$
$x=3 \quad \vee \quad x=-1$

f. $\frac{1}{4}(2x-7)^7 - 12 = -44$

$\frac{1}{4}(2x-7)^7 = -32$

$(2x-7)^7 = -128$

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

$2x = 5$

$x = 2\frac{1}{2}$

Opgave 3:

a. $5x^3 - 1 = 9$

$5x^3 = 10$

$x^3 = 2$

$x = \sqrt[3]{2} = 1{,}260$

b. $\frac{1}{2}(x-1)^4 = 12$

$(x-1)^4 = 24$

$x-1 = \sqrt[4]{24} = 2{,}213 \quad \vee \quad x-1 = -\sqrt[4]{24} = -2{,}213$

$x = 3{,}213 \quad \vee \quad x = -1{,}213$

c. $(1-2x)^5 - 4 = 12$

$(1-2x)^5 = 16$

$1-2x = \sqrt[5]{16} = 1{,}741$

$-2x = 0{,}741$

$x = -0{,}371$

d. $\frac{1}{3}(4-3x)^3 + 12 = 6$

$\frac{1}{3}(4-3x)^3 = -6$

$(4-3x)^3 = -18$

$4-3x = \sqrt[3]{-18} = -2{,}621$

$-3x = -6{,}621$

$x = 2{,}207$

Opgave 4:

a. $y_1 = 0{,}1x^3 - 2x + 2$

optie zero: $x = -4{,}91 \quad \vee \quad x = 1{,}06 \quad \vee \quad x = 3{,}85$

b. $y_1 = 6 - 0{,}5x^2 \quad y_2 = x^3 - 8x$

optie intersect: $x = -2{,}66 \quad \vee \quad x = -0{,}77 \quad \vee \quad x = 2{,}93$

Opgave 5:

a. $y_1 = -0{,}5x^3 + 4x^2 - 12$

optie zero: $x = -1{,}58 \quad \vee \quad x = 2 \quad \vee \quad x = 7{,}58$

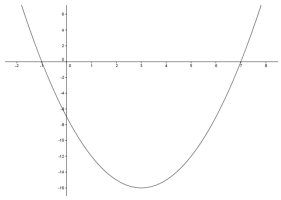
b. $y_1 = 0{,}1x^4 - 0{,}2x^3 - 4x^2 + 6x + 4$

optie zero: $x = -6{,}06 \quad \vee \quad x = -0{,}50 \quad \vee \quad x = 2 \quad \vee \quad x = 6{,}56$

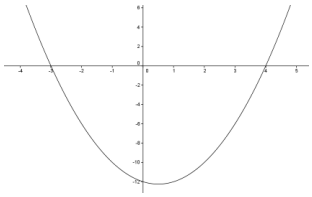
Opgave 6:

a. $5(7-x) > 3(2x-3)$
$35-5x > 6x-9$
$-11x > -44$
$x < 4$

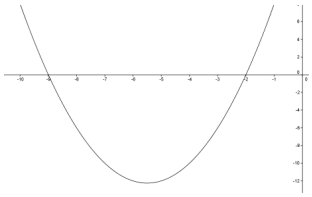
b. $x^2 - 7x < -x + 7$
$x^2 - 6x - 7 < 0$
$(x-7)(x+1) = 0$
$x = 7 \quad \vee \quad x = -1$
$-1 < x < 7$



c. $2x^2 + 5x - 12 > x^2 + 6x$
$x^2 - x - 12 > 0$
$(x-4)(x+3) = 0$
$x = 4 \quad \vee \quad x = -3$
$x < -3 \quad \vee \quad x > 4$

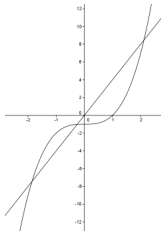


d. $x^2 - 9 > 2x^2 + 11x + 9$
$-x^2 - 11x - 18 > 0$
$x^2 + 11x + 18 < 0$
$(x+2)(x+9) = 0$
$x = -2 \quad \vee \quad x = -9$
$-9 < x < -2$

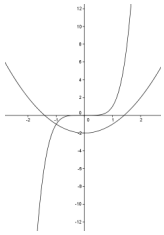


Opgave 7:

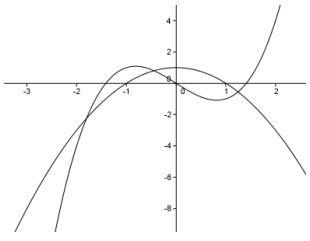
a. $y_1 = x^3 - 1 \quad y_2 = 4x$
intersect: $x = -1{,}86 \quad \vee \quad x = -0{,}25 \quad \vee \quad x = 2{,}11$
$-1{,}86 < x < -0{,}25 \quad \vee \quad x > 2{,}11$



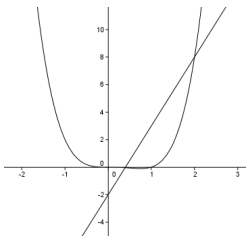
b. $y_1 = x^5 \quad y_2 = x^2 - 2$
intersect: $x = -1$
$x < -1$



c. $y_1 = x^3 - 2x \quad y_2 = -x^2 + 1$
intersect: $x = -1{,}80 \quad \vee \quad x = -0{,}45 \quad \vee \quad x = 1{,}25$
$x < -1{,}80 \quad \vee \quad -0{,}45 < x < 1{,}25$



d. $y_1 = x^4 - x^3 \quad y_2 = 5x - 2$
intersect: $x = 0{,}39 \quad \vee \quad x = 2$
$x < 0{,}39 \quad \vee \quad x > 2$



Opgave 8:

$y_1 = -4x^2 + 28x + 2 \quad y_2 = 40$

intersect: $x = 1{,}84 \quad \vee \quad x = 5{,}16$

dus $\Delta t = 5{,}16 - 1{,}84 = 3{,}3 \,\text{sec}$