

## 14.2 Kwadratische problemen

### Opgave 23:

a.  $R = p \cdot q = (-0,002q + 4) \cdot q = -0,002q^2 + 4q$

b.  $R' = -0,004q + 4 = 0$

$$-0,004q = -4$$

$$q = 1000$$

$$R = 2000 \text{ dus } 2000 \text{ euro}$$

c.  $K = 0,6q + 200$

$$W = R - K = -0,002q^2 + 4q - (0,6q + 200) = -0,002q^2 + 3,4q - 200$$

d.  $W' = -0,004q + 3,4 = 0$

$$-0,004q = -3,4$$

$$q = 850$$

$$p = 2,3 \text{ dus } 2,30 \text{ euro}$$

### Opgave 24:

a.  $20x^2 - 160x + 300 = 0$

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

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

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

b.  $0,02x^2 - 8x = 0$

$$0,02x(x - 400) = 0$$

$$x = 0 \quad \vee \quad x = 400$$

c.  $q(4 - 0,2q) = 15$

$$4q - 0,2q^2 = 15$$

$$-0,2q^2 + 4q - 15 = 0$$

$$q^2 - 20q + 75 = 0$$

$$(q - 5)(q - 15) = 0$$

$$q = 5 \quad \vee \quad q = 15$$

d.  $q(-0,01q + 40) = 0$

$$q = 0 \quad \vee \quad -0,01q = -40$$

$$q = 0 \quad \vee \quad q = 4000$$

### Opgave 25:

a.  $R = -0,002q^2 + 24q = 0$

$$q(-0,002q + 24) = 0$$

$$q = 0 \quad \vee \quad -0,002q = -24$$

$$q = 0 \quad \vee \quad q = 12000$$

b.  $R' = -0,004q + 24 = 0$

$$-0,004q = -24$$

$$q = 6000$$

$$R = 72000 \text{ dus } 72000 \text{ euro}$$

c.  $-0,002q^2 + 24q = 64000$

$$-0,002q^2 + 24q - 64000 = 0$$

$$q^2 - 12000q + 32000000 = 0$$

$$(q - 4000)(q - 8000) = 0$$

$$q = 4000 \quad \vee \quad q = 8000$$

d.  $4000 < q < 8000$

### **Opgave 26:**

a.  $p = aq + b$

$$a = \frac{\Delta p}{\Delta q} = \frac{-8}{800} = -0,01$$

$$p = -0,001q + b \text{ door } (400,28)$$

$$28 = -4 + b$$

$$b = 32$$

$$p = -0,01q + 32$$

$$R = p \cdot q = (-0,01q + 32) \cdot q = -0,01q^2 + 32q$$

b.  $-0,01q^2 + 32q = 24000$

$$-0,01q^2 + 32q - 24000 = 0$$

$$q^2 - 3200q + 2400000 = 0$$

$$(q - 1200)(q - 2000) = 0$$

$$q = 1200 \quad \vee \quad q = 2000$$

$$p = 20 \quad \vee \quad p = 12$$

c.  $W = R - K = -0,01q^2 + 32q - (16q + 1500) = -0,01q^2 + 16q - 1500$

$$W' = -0,02q + 16 = 0$$

$$-0,02q = -16$$

$$q = 800$$

$$W = 4900 \text{ dus } 4900 \text{ euro}$$

$$p = 24 \text{ dus } 24 \text{ euro}$$

d.  $W = -0,01q^2 + 16q - K_{vast}$

$$W(800) = -6400 + 12800 - K_{vast} = 6000$$

$$-K_{vast} = -400$$

$$K_{vast} = 400 \text{ dus } 400 \text{ euro}$$

### **Opgave 27:**

a.  $h = -0,18x^2 + 0,96 = 0$

$$-0,18x^2 = -0,96$$

$$x^2 = 5\frac{1}{3}$$

$$x = \sqrt{5\frac{1}{3}} = 2,31 \quad \vee \quad x = -\sqrt{5\frac{1}{3}} = -2,31$$

$$\text{dus } AB = 2 \cdot 2,31 = 4,62$$

$$\text{dus } 462 \text{ feet} = 145 \text{ meter}$$

b.  $h(0) = 0,96$

$$x_Q = 1,9$$

$$h(1,9) = 0,3102$$

$$\text{dus } 0,96 - 0,3102 = 0,65 \text{ feet}$$

c.  $h = 0,96 - 0,7 = 0,26$   
 $-0,18x^2 + 0,96 = 0,26$   
 $-0,18x^2 = -0,7$   
 $x^2 = 3,89$   
 $x = 1,97 \quad \vee \quad x = -1,97$   
dus  $2 \cdot 1,97 \cdot 100 \cdot 0,314 = 123,8$  meter

**Opgave 28:**

- a. Uit  $x^2 = 16$  volgt  $x = 4 \quad \vee \quad x = -4$   
dus uit  $(2x-1)^2 = 16$  volgt  $2x-1 = 4 \quad \vee \quad 2x-1 = -4$
- b.  $(2x-1)^2 = 16$   
 $2x-1 = 4 \quad \vee \quad 2x-1 = -4$   
 $2x = 5 \quad \vee \quad 2x = -3$   
 $x = 2\frac{1}{2} \quad \vee \quad x = -1\frac{1}{2}$
- c. iets in het kwadraat kan nooit  $-16$  zijn

**Opgave 29:**

- a.  $(x-3)(2x+1) = (x-3)(x+5)$   
 $2x^2 - 5x - 3 = x^2 + 2x - 15$   
 $x^2 - 7x + 12 = 0$   
 $(x-3)(x-4) = 0$   
 $x = 3 \quad \vee \quad x = 4$
- b.  $2x+1 = x+5$   
 $x = 4$
- c. nee

**Opgave 30:**

- a.  $(3x-2)^2 = 49$   
 $3x-2 = 7 \quad \vee \quad 3x-2 = -7$   
 $3x = 9 \quad \vee \quad 3x = -5$   
 $x = 3 \quad \vee \quad x = -\frac{5}{3}$
- b.  $(3x-1)(5x-3) = (3x-1)(6x+5)$   
 $3x-1 = 0 \quad \vee \quad 5x-3 = 6x+5$   
 $3x = 1 \quad \vee \quad -x = 8$   
 $x = \frac{1}{3} \quad \vee \quad x = -8$
- c.  $(x-3)^2 = (2x-7)^2$   
 $x-3 = 2x-7 \quad \vee \quad x-3 = -2x+7$   
 $-x = -4 \quad \vee \quad 3x = 10$   
 $x = 4 \quad \vee \quad x = \frac{10}{3}$
- d.  $(x^2-1)(4x-3) - 5(x^2-1) = 0$   
 $(x^2-1)(4x-3) = 5(x^2-1)$   
 $x^2-1 = 0 \quad \vee \quad 4x-3 = 5$   
 $x^2 = 1 \quad \vee \quad 4x = 8$

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

**Opgave 31:**

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

$$x+2=0 \vee x^2+2x+1=1$$

$$x=-2 \vee x^2+2x=0$$

$$x=-2 \vee x(x+2)=0$$

$$x=-2 \vee x=0 \vee x=-2$$

b.  $5\sqrt{x^2-3}=(2x-1)\sqrt{x^2-3}$

$$\sqrt{x^2-3}=0 \vee 5=2x-1$$

$$x^2-3=0 \vee -2x=-6$$

$$x^2=3 \vee x=3$$

$$x=1,73 \vee x=-1,73 \vee x=3$$

c.  $(x-1)(x+3)=(x-1)(x^2+6x+3)$

$$x-1=0 \vee x+3=x^2+6x+3$$

$$x=1 \vee -x^2-5x=0$$

$$x=1 \vee -x(x+5)=0$$

$$x=1 \vee x=0 \vee x=-5$$

d.  $5(3x-5)=(x-1)(3x-5)$

$$3x-5=0 \vee 5=x-1$$

$$3x=5 \vee -x=-6$$

$$x=\frac{5}{3} \vee x=6$$

e.  $7(x-3)^2=(x+1)(x-3)^2$

$$(x-3)^2=0 \vee 7=x+1$$

$$x=3 \vee x=6$$

f.  $(2x-1)^2\sqrt{2x-1}=25\sqrt{2x-1}$

$$\sqrt{2x-1}=0 \vee (2x-1)^2=25$$

$$2x-1=0 \vee 2x-1=5 \vee 2x-1=-5$$

$$2x=1 \vee 2x=6 \vee 2x=-4$$

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

g.  $(x^2-5)^3=9(x^2-5)$

$$x^2-5=0 \vee (x^2-5)^2=9$$

$$x^2=5 \vee x^2-5=3 \vee x^2-5=-3$$

$$x^2=5 \vee x^2=8 \vee x^2=2$$

$$x=2,24 \vee x=-2,24 \vee x=2,83 \vee x=-2,83 \vee x=1,41 \vee x=-1,41$$

h.  $(2x-1)(x^2-36)=(x^2-36)(x+7)$

$$x^2-36=0 \vee 2x-1=x+7$$

$$x^2=36 \vee x=8$$

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

**Opgave 32:**

- a.  $(5x^2 - 30)(3x + 1) = 0$   
 $5x^2 = 30 \quad \vee \quad 3x = -1$   
 $x^2 = 6 \quad \vee \quad x = -\frac{1}{3}$   
 $x = 2,45 \quad \vee \quad x = -2,45 \quad \vee \quad x = -\frac{1}{3}$
- b.  $(5x^2 - 125)(3x + 1) = (5x^2 - 125)(x^2 + 1)$   
 $5x^2 - 125 = 0 \quad \vee \quad 3x + 1 = x^2 + 1$   
 $5x^2 = 125 \quad \vee \quad -x^2 + 3x = 0$   
 $x^2 = 25 \quad \vee \quad -x(x - 3) = 0$   
 $x = 5 \quad \vee \quad x = -5 \quad \vee \quad x = 0 \quad \vee \quad x = 3$
- c.  $3x\sqrt{x^2 - 4} = (x + 3)\sqrt{x^2 - 4}$   
 $\sqrt{x^2 - 4} = 0 \quad \vee \quad 3x = x + 3$   
 $x^2 - 4 = 0 \quad \vee \quad 2x = 3$   
 $x^2 = 4 \quad \vee \quad x = 1\frac{1}{2}$   
 $x = 2 \quad \vee \quad x = -2 \quad \vee \quad x = 1\frac{1}{2}$
- d.  $5\sqrt{x^2 - 4} - x\sqrt{x^2 - 4} = 0$   
 $5\sqrt{x^2 - 4} = x\sqrt{x^2 - 4}$   
 $\sqrt{x^2 - 4} = 0 \quad \vee \quad 5 = x$   
 $x^2 - 4 = 0 \quad \vee \quad x = 5$   
 $x^2 = 4 \quad \vee \quad x = 5$   
 $x = 2 \quad \vee \quad x = -2 \quad \vee \quad x = 5$
- e.  $6(5x - 3) - (2x - 3)(x + 6) = 0$   
 $30x - 18 - (2x^2 + 9x - 18) = 0$   
 $30x - 18 - 2x^2 - 9x + 18 = 0$   
 $-2x^2 + 21x = 0$   
 $-2x(x - 10\frac{1}{2}) = 0$   
 $x = 0 \quad \vee \quad x = 10\frac{1}{2}$
- f.  $(x + 2)(x + 3) = (x + 4)(x + 5)$   
 $x^2 + 5x + 6 = x^2 + 9x + 20$   
 $-4x = 14$   
 $x = -3\frac{1}{2}$

**Opgave 33:**

- a.  $K = 0,2 \cdot 0,6(a - 3)^2 + 25 = 0,12(a - 3)^2 + 25$
- b.  $0,12(a - 3)^2 + 25 = 37$   
 $0,12(a - 3)^2 = 12$   
 $(a - 3)^2 = 100$   
 $a - 3 = 10 \quad \vee \quad a - 3 = -10$   
 $a = 13 \quad \vee \quad a = 7$

**Opgave 34:**

$x = 3$  en  $y = 5$  invullen geeft  $9a + 3b + 8 = 5$

**Opgave 35:**

$$\begin{cases} 4a - 2b = -24 & | \times 1 \\ a + b = 3 & | \times 2 \end{cases}$$

$$\begin{cases} 4a - 2b = -24 \\ 2a + 2b = 6 & + \end{cases}$$

$$6a = -18$$

$$a = -3$$

$$b = 6$$

**Opgave 36:**

door  $(0,0)$  dus  $c = 0$

$$\begin{cases} a + b = 300 & | \times 2 \\ 4a + 2b = 500 & | \times 1 \end{cases}$$

$$\begin{cases} 2a + 2b = 600 \\ 4a + 2b = 500 & - \end{cases}$$

$$-2a = 100$$

$$a = -50$$

$$b = 350$$

**Opgave 37:**

a. 
$$\begin{cases} 6,25a + 2,5b + 60000 = 40000 & | \times 2 \\ 25a + 5b + 60000 = 25000 & | \times 1 \end{cases}$$

$$\begin{cases} 12,5a + 5b + 120000 = 80000 \\ 25a + 5b + 60000 = 25000 & - \end{cases}$$

$$-12,5a + 60000 = 55000$$

$$-12,5a = -5000$$

$$a = 400$$

$$10000 + 5b + 60000 = 25000$$

$$5b = -45000$$

$$b = -9000$$

b.  $R = A \cdot T = 400T^3 - 9000T^2 + 60000T$

c.  $R' = 1200T^2 - 18000T + 60000 = 0$

$$T^2 - 15T + 50 = 0$$

$$(T - 5)(T - 10) = 0$$

$$T = 5 \quad \vee \quad T = 10 \text{ (vervalt)}$$

het toltarief is € 5,-