

## Hoofdstuk 9: Exponentiële en logaritmische functies

### 9.1 Logaritmische en exponentiële vergelijkingen

#### Opgave 1:

- $y_2$  en  $y_3$
- $y_2$  en  $y_3$
- $y_1$  en  $y_3$

#### Opgave 2:

- ${}^2\log 6 + {}^2\log 10 = {}^2\log 60$
- ${}^3\log 30 - {}^3\log 6 = {}^3\log 5$
- $2 \cdot {}^5\log 3 + {}^5\log \frac{1}{2} = {}^5\log 3^2 + {}^5\log \frac{1}{2} = {}^5\log 9 + {}^5\log \frac{1}{2} = {}^5\log 4 \frac{1}{2}$
- $\frac{1}{2} \log 15 - 4 \cdot \frac{1}{2} \log 3 = \frac{1}{2} \log 15 - \frac{1}{2} \log 3^4 = \frac{1}{2} \log 15 - \frac{1}{2} \log 81 = \frac{1}{2} \log \frac{15}{81} = \frac{1}{2} \log \frac{5}{27}$
- $-2 \cdot {}^4\log 6 + {}^4\log 12 = {}^4\log 6^{-2} + {}^4\log 12 = {}^4\log \frac{1}{36} + {}^4\log 12 = {}^4\log \frac{12}{36} = {}^4\log \frac{1}{3}$
- $\log 50 - 2 \cdot \log 5 = \log 50 - \log 5^2 = \log 50 - \log 25 = \log 2$

#### Opgave 3:

- $4 + {}^2\log 3 = {}^2\log 2^4 + {}^2\log 3 = {}^2\log 16 + {}^2\log 3 = {}^2\log 48$
- $3 - \frac{1}{2} \log 10 = \frac{1}{2} \log \left(\frac{1}{2}\right)^3 - \frac{1}{2} \log 10 = \frac{1}{2} \log \frac{1}{8} - \frac{1}{2} \log 10 = \frac{1}{2} \log \frac{1}{80}$
- $2 - \log 5 = \log 10^2 - \log 5 = \log 100 - \log 5 = \log 20$
- ${}^2\log 12 - {}^3\log 9 = {}^2\log 12 - 2 = {}^2\log 12 - {}^2\log 2^2 = {}^2\log 12 - {}^2\log 4 = {}^2\log 3$
- $\frac{1}{2} \cdot {}^3\log 16 + \frac{1}{2} \log 8 = {}^3\log 16^{\frac{1}{2}} + -3 = {}^3\log 4 - {}^3\log 3^3 = {}^3\log 4 - {}^3\log 27 = {}^3\log \frac{4}{27}$
- $\log 500 - {}^5\log 125 = \log 500 - 3 = \log 500 - \log 10^3 = \log 500 - \log 1000 = \log \frac{1}{2}$

#### Opgave 4:

- ${}^3\log 6 + {}^3\log 1 \frac{1}{2} = {}^3\log 9 = 2$
- ${}^5\log 2 - {}^5\log 50 = {}^5\log \frac{2}{50} = {}^5\log \frac{1}{25} = -2$
- ${}^2\log 27 + 3 \cdot {}^2\log \frac{1}{6} = {}^2\log 27 + {}^2\log \left(\frac{1}{6}\right)^3 = {}^2\log 27 + {}^2\log \frac{1}{216} = {}^2\log \frac{27}{216} = {}^2\log \frac{1}{8} = -3$
- $2 \cdot {}^4\log 6 - 2 \cdot {}^4\log 3 = {}^4\log 6^2 - {}^4\log 3^2 = {}^4\log 36 - {}^4\log 9 = {}^4\log 4 = 1$

#### Opgave 5:

- $g^{\log a - \log b} = \frac{g^{\log a}}{g^{\log b}} = \frac{a}{b} = g^{\log \frac{a}{b}}$
- $g^{n \cdot \log a} = \left(g^{\log a}\right)^n = a^n = g^{\log a^n}$

#### Opgave 6:

- $3 + {}^2\log 3 = {}^2\log 2^3 + {}^2\log 3 = {}^2\log 8 + {}^2\log 3 = {}^2\log 24$
- ${}^2\log(x+1) = 3 + {}^2\log 3$   
 ${}^2\log(x+1) = {}^2\log 24$   
 $x+1 = 24$

$$x = 23$$

**Opgave 7:**

a.  ${}^5 \log x = 3 \cdot {}^5 \log 2 - 2 \cdot {}^5 \log 3$

$${}^5 \log x = {}^5 \log 2^3 - {}^5 \log 3^2$$

$${}^5 \log x = {}^5 \log 8 - {}^5 \log 9$$

$${}^5 \log x = {}^5 \log \frac{8}{9}$$

$$x = \frac{8}{9}$$

b.  ${}^2 \log x = 4 - {}^2 \log 3$

$${}^2 \log x = {}^2 \log 4^2 - {}^2 \log 3$$

$${}^2 \log x = {}^2 \log 16 - {}^2 \log 3$$

$${}^2 \log x = {}^2 \log \frac{16}{3}$$

$$x = \frac{16}{3} = 5\frac{1}{3}$$

c.  ${}^2 \log(x+3) = 3 + {}^2 \log x$

$${}^2 \log(x+3) = {}^2 \log 2^3 + {}^2 \log x$$

$${}^2 \log(x+3) = {}^2 \log 8 + {}^2 \log x$$

$${}^2 \log(x+3) = {}^2 \log 8x$$

$$x+3 = 8x$$

$$-7x = -3$$

$$x = \frac{3}{7}$$

d.  ${}^3 \log 2x = 1 + {}^3 \log(x+1)$

$${}^3 \log 2x = {}^3 \log 3 + {}^3 \log(x+1)$$

$${}^3 \log 2x = {}^3 \log 3(x+1)$$

$$2x = 3(x+1)$$

$$2x = 3x + 3$$

$$-x = 3$$

$$x = -3 \text{ vervalt}$$

dus geen oplossingen

**Opgave 8:**

a.  $5 \cdot \log x = 5 - \log 3125$

$$\log x = 1 - \frac{1}{5} \cdot \log 3125$$

$$\log x = 1 - \log 3125^{\frac{1}{5}}$$

$$\log x = \log 10 - \log 5$$

$$\log x = \log 2$$

$$x = 2$$

b.  $\frac{1}{2} \log(2x-1) = 2 + \frac{1}{2} \log(x+2)$

$$\frac{1}{2} \log(2x-1) = \frac{1}{2} \log\left(\frac{1}{2}\right)^2 + \frac{1}{2} \log(x+2)$$

$$\frac{1}{2} \log(2x-1) = \frac{1}{2} \log \frac{1}{4} + \frac{1}{2} \log(x+2)$$

$$\frac{1}{2} \log(2x-1) = \frac{1}{2} \log \frac{1}{4}(x+2)$$

$$2x - 1 = \frac{1}{4}(x + 2)$$

$$2x - 1 = \frac{1}{4}x + \frac{1}{2}$$

$$1\frac{3}{4}x = 1\frac{1}{2}$$

$$x = \frac{6}{7}$$

c.  ${}^3\log(x+2) = 1 - {}^3\log x$

$${}^3\log(x+2) = {}^3\log 3 - {}^3\log x$$

$${}^3\log(x+2) + {}^3\log x = {}^3\log 3$$

$${}^3\log x(x+2) = {}^3\log 3$$

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

$$x^2 + 2x = 3$$

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

$$(x+3)(x-1) = 0$$

$$x = -3 \text{ (vervalt)} \quad \vee \quad x = 1$$

$$\text{dus } x = 1$$

d.  $2 \cdot {}^3\log x + 1 = {}^3\log(5x-2)$

$${}^3\log x^2 + {}^3\log 3 = {}^3\log(5x-2)$$

$${}^3\log 3x^2 = {}^3\log(5x-2)$$

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

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

$$x = \frac{5 \pm \sqrt{1}}{6} = \frac{5 \pm 1}{6}$$

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

### Opgave 9:

a.  ${}^5\log x = 2 + \frac{1}{2} \cdot {}^5\log 3$

$${}^5\log x = {}^5\log 25 + {}^5\log 3^{\frac{1}{2}}$$

$${}^5\log x = {}^5\log 25 + {}^5\log \sqrt{3}$$

$${}^5\log x = {}^5\log 25\sqrt{3}$$

$$x = 25\sqrt{3}$$

b.  ${}^3\log(x+4) + 1 = 2 \cdot {}^3\log(x-2)$

$${}^3\log(x+4) + {}^3\log 3 = {}^3\log(x-2)^2$$

$${}^3\log 3(x+4) = {}^3\log(x-2)^2$$

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

$$3x + 12 = x^2 - 4x + 4$$

$$-x^2 + 7x + 8 = 0$$

$$x^2 - 7x - 8 = 0$$

$$(x+1)(x-8) = 0$$

$$x = -1 \text{ vervalt} \quad \vee \quad x = 8$$

$$\text{dus } x = 8$$

c.  ${}^2\log 2x - {}^2\log(x+3) = {}^2\log x - 2$

$${}^2\log 2x + 2 = {}^2\log(x+3) + {}^2\log x$$

$${}^2\log 2x + {}^2\log 4 = {}^2\log x(x+3)$$

$${}^2\log 8x = {}^2\log(x^2 + 3x)$$

$$8x = x^2 + 3x$$

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

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

$$x = 0 \text{ vervalt} \quad \vee \quad x = 5$$

dus  $x = 5$

d.  ${}^3\log x = 2 - {}^3\log(x-1)$

$${}^3\log x + {}^3\log(x-1) = 2$$

$${}^3\log x(x-1) = {}^3\log 9$$

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

$$x^2 - x = 9$$

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

$$x = \frac{1 \pm \sqrt{37}}{2}$$

$$x = \frac{1}{2} + \frac{1}{2}\sqrt{37} \quad \vee \quad x = \frac{1}{2} - \frac{1}{2}\sqrt{37} \text{ vervalt}$$

$$\text{dus } x = \frac{1}{2} + \frac{1}{2}\sqrt{37}$$

### **Opgave 10:**

a.  $p^2 - 2p - 8 = 0$

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

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

b.  ${}^2\log x = -2 \quad \vee \quad {}^2\log x = 4$

$$x = 2^{-2} = \frac{1}{4} \quad \vee \quad x = 2^4 = 16$$

### **Opgave 11:**

$${}^3\log 4 = \frac{\log 4}{\log 3} = 1,262$$

$${}^{\frac{1}{2}}\log 3 = \frac{\log 3}{\log \frac{1}{2}} = -1,585$$

### **Opgave 12:**

a.  ${}^3\log(3x-5) + {}^{\frac{1}{3}}\log(x-1) = 0$

$${}^3\log(3x-5) - {}^3\log(x-1) = 0$$

$${}^3\log(3x-5) = {}^3\log(x-1)$$

$$3x-5 = x-1$$

$$2x = 4$$

$$x = 2$$

b.  ${}^5\log 3x + 2 \cdot {}^{\frac{1}{5}}\log x = 0$

$${}^5\log 3x + 2 \cdot {}^{-5}\log x = 0$$

$${}^5\log 3x = 2 \cdot {}^5\log x$$

$${}^5\log 3x = {}^5\log x^2$$

$$3x = x^2$$

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

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

$$x = 0 \text{ vervalt} \quad \vee \quad x = 3$$

$$\text{dus } x = 3$$

c.  $2x \cdot {}^{\frac{1}{3}}\log(3x+5) = {}^{\frac{1}{3}}\log(3x+5)$

$$2x = 1 \quad \vee \quad {}^{\frac{1}{3}}\log(3x+5) = 0$$

$$x = \frac{1}{2} \quad \vee \quad 3x+5 = \left(\frac{1}{3}\right)^0$$

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

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

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

d.  ${}^2\log^2 x = 2 \cdot {}^2\log x + 3$

$$\text{stel } p = {}^2\log x \text{ dan } p^2 = 2p + 3$$

$$p^2 - 2p - 3 = 0$$

$$(p+1)(p-3) = 0$$

$$p = -1 \quad \vee \quad p = 3$$

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

$$x = 2^{-1} = \frac{1}{2} \quad \vee \quad x = 2^3 = 8$$

### **Opgave 13:**

a.  $-2 \cdot {}^{\frac{1}{2}}\log x = 2 + {}^2\log(3-x)$

$$-2 \cdot {}^{-2}\log x = {}^2\log 4 + {}^2\log(3-x)$$

$${}^2\log x^2 = {}^2\log 4(3-x)$$

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

$$x^2 = 12 - 4x$$

$$x^2 + 4x - 12 = 0$$

$$(x+6)(x-2) = 0$$

$$x = -6 \text{ vervalt} \quad \vee \quad x = 2$$

$$\text{dus } x = 2$$

b.  ${}^9\log 2x = {}^3\log(x-4)$

$$\frac{{}^3\log 2x}{{}^3\log 9} = {}^3\log(x-4)$$

$$\frac{{}^3\log 2x}{2} = {}^3\log(x-4)$$

$${}^3\log 2x = 2 \cdot {}^3\log(x-4)$$

$${}^3\log 2x = {}^3\log(x-4)^2$$

$$2x = (x-4)^2$$

$$2x = x^2 - 8x + 16$$

$$-x^2 + 10x - 16 = 0$$

$$x^2 - 10x + 16 = 0$$

$$(x-2)(x-8) = 0$$

$$x = 2 \text{ vervalt} \quad \vee \quad x = 8$$

dus  $x = 8$

c.  $4x \cdot {}^4\log(2x-1) + 3 \cdot {}^4\log(2x-1) = 0$

$$(4x+3) \cdot {}^4\log(2x-1) = 0$$

$$4x+3 = 0 \quad \vee \quad {}^4\log(2x-1) = 0$$

$$4x = -3 \quad \vee \quad 2x-1 = 4^0$$

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

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

$$x = -\frac{3}{4} \text{ vervalt} \quad \vee \quad x = 1$$

dus  $x = 1$

d.  $\frac{1}{2}\log^2(x+2) + 3 \cdot \frac{1}{2}\log(x+2) = 0$

stel  $p = \frac{1}{2}\log(x+2)$  dan  $p^2 + 3p = 0$

$$p(p+3) = 0$$

$$p = 0 \quad \vee \quad p = -3$$

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

$$x+2 = \left(\frac{1}{2}\right)^0 \quad \vee \quad x+2 = \left(\frac{1}{2}\right)^{-3}$$

$$x+2 = 1 \quad \vee \quad x+2 = 8$$

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

#### **Opgave 14:**

a.  $3x \cdot {}^2\log(x+1) = \frac{1}{2}\log(x+1)$

$$3x \cdot {}^2\log(x+1) = -{}^2\log(x+1)$$

$$3x \cdot {}^2\log(x+1) + {}^2\log(x+1) = 0$$

$$(3x+1) \cdot {}^2\log(x+1) = 0$$

$$3x+1 = 0 \quad \vee \quad {}^2\log(x+1) = 0$$

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

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

$$x = -\frac{1}{3} \quad \vee \quad x = 0$$

b.  $x^2 \cdot {}^5\log(2x+1) + 9 \cdot \frac{1}{5}\log(2x+1) = 0$

$$x^2 \cdot {}^5\log(2x+1) + 9 \cdot -{}^5\log(2x+1) = 0$$

$$(x^2-9) \cdot {}^5\log(2x+1) = 0$$

$$x^2-9 = 0 \quad \vee \quad {}^5\log(2x+1) = 0$$

$$x^2 = 9 \quad \vee \quad 2x+1 = 5^0$$

$$x = 3 \quad \vee \quad x = -3 \text{ vervalt} \quad \vee \quad 2x+1 = 1$$

$$x = 3 \quad \vee \quad 2x = 0$$

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

c.  $2 \cdot 3 \log^2 x + 2 = 5 \cdot 3 \log x$

stel  $p = 3 \log x$  dan  $2p^2 + 2 = 5p$

$$2p^2 - 5p + 2 = 0$$

$$p = \frac{5 \pm \sqrt{9}}{4} = \frac{5 \pm 3}{4}$$

$$p = 2 \quad \vee \quad p = \frac{1}{2}$$

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

$$x = 3^2 = 9 \quad \vee \quad x = 3^{\frac{1}{2}} = \sqrt{3}$$

d.  $5 \log^2 x + 3 \cdot 5 \log x + 2 = 0$

$$5 \log^2 x + 3 \cdot 5 \log x + 2 = 0$$

stel  $p = 5 \log x$  dan  $p^2 - 3p + 2 = 0$

$$(p-1)(p-2) = 0$$

$$p = 1 \quad \vee \quad p = 2$$

$$5 \log x = 1 \quad \vee \quad 5 \log x = 2$$

$$x = 5^1 = 5 \quad \vee \quad x = 5^2 = 25$$

### **Opgave 15:**

7 kun je niet als macht van 2 schrijven

### **Opgave 16:**

a.  $p^2 + 2p = 8$

$$p^2 + 2p - 8 = 0$$

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

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

b.  $2^x = -4 \quad \vee \quad 2^x = 2$

k.n.  $x = 1$

### **Opgave 17:**

a.  $3^x - 2 = 8 \cdot \left(\frac{1}{3}\right)^x$

$$3^x - 2 = 8 \cdot \frac{1}{3^x}$$

stel  $p = 3^x$  dan  $p - 2 = 8 \cdot \frac{1}{p}$

$$p^2 - 2p = 8$$

$$p^2 - 2p - 8 = 0$$

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

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

$$3^x = -2 \quad \vee \quad 3^x = 4$$

k.n.  $x = 3 \log 4$

b.  $2^x = 6 - 5 \cdot \left(\frac{1}{2}\right)^x$

$$2^x = 6 - 5 \cdot \frac{1}{2^x}$$

$$\text{stel } p = 2^x \text{ dan } p = 6 - 5 \cdot \frac{1}{p}$$

$$p^2 = 6p - 5$$

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

$$(p-1)(p-5) = 0$$

$$p = 1 \quad \vee \quad p = 5$$

$$2^x = 1 \quad \vee \quad 2^x = 5$$

$$x = 0 \quad \vee \quad x = {}^2\log 5$$

c.  $9^x = 4 + 3^{x+1}$

$$(3^2)^x = 4 + 3^1 \cdot 3^x$$

$$(3^x)^2 = 4 + 3 \cdot 3^x$$

$$\text{Stel } p = 3^x \text{ dan } p^2 = 4 + 3p$$

$$p^2 - 3p - 4 = 0$$

$$(p+1)(p-4) = 0$$

$$p = -1 \quad \vee \quad p = 4$$

$$3^x = -1 \quad \vee \quad 3^x = 4$$

$$\text{k.n.} \quad x = {}^3\log 4$$

d.  $2^x = 24 - 2^{2x-1}$

$$2^x = 24 - 2^{-1} \cdot 2^{2x}$$

$$2^x = 24 - \frac{1}{2} \cdot (2^x)^2$$

$$\text{stel } p = 2^x \text{ dan } p = 24 - \frac{1}{2} p^2$$

$$\frac{1}{2} p^2 + p - 24 = 0$$

$$p^2 + 2p - 48 = 0$$

$$(p+8)(p-6) = 0$$

$$p = -8 \quad \vee \quad p = 6$$

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

$$\text{k.n.} \quad x = {}^2\log 6$$

### **Opgave 18:**

a.  $3^{2x-1} = 10$

$$2x - 1 = {}^3\log 10$$

$$2x = 1 + {}^3\log 10$$

$$x = \frac{1 + {}^3\log 10}{2} = \frac{1}{2} + \frac{1}{2} \cdot {}^3\log 10 = 1,55$$

b.  $5 \cdot 4^{x-2} = 16$

$$4^{x-2} = 3,2$$

$$x - 2 = {}^4\log 3,2$$

$$x + 2 = {}^4\log 3,2 = 2,84$$

c.  $9^x = 2 \cdot 3^x + 6$   
 $(3^2)^x = 2 \cdot 3^x + 6$   
 $(3^x)^2 = 2 \cdot 3^x + 6$   
 stel  $p = 3^x$  dan  $p^2 = 2p + 6$   
 $p^2 - 2p - 6 = 0$   
 $p = \frac{2 \pm \sqrt{28}}{2} = \frac{2 \pm 2\sqrt{7}}{2} = 1 \pm \sqrt{7}$   
 $3^x = 1 + \sqrt{7} \quad \vee \quad 3^x = 1 - \sqrt{7}$  (k.n.)  
 $x = {}^3\log(1 + \sqrt{7}) = 1,18$

d.  $2^x + 2^{-x} = 3$   
 $2^x + \frac{1}{2^x} = 3$   
 stel  $p = 2^x$  dan  $p + \frac{1}{p} = 3$   
 $p^2 + 1 = 3p$   
 $p^2 - 3p + 1 = 0$   
 $p = \frac{3 \pm \sqrt{5}}{2} = 1\frac{1}{2} \pm \frac{1}{2}\sqrt{5}$   
 $2^x = 1\frac{1}{2} + \sqrt{5} \quad \vee \quad 2^x = 1\frac{1}{2} - \sqrt{5}$   
 $x = {}^2\log(1\frac{1}{2} + \sqrt{5}) = 1,39 \quad \vee \quad x = {}^2\log(1\frac{1}{2} - \frac{1}{2}\sqrt{5}) = -1,39$

**Opgave 19:**

a.  $3^{x+2} + 3^x = 600$   
 $3^2 \cdot 3^x + 1 \cdot 3^x = 600$   
 $9 \cdot 3^x + 1 \cdot 3^x = 600$   
 $10 \cdot 3^x = 600$   
 $3^x = 60$   
 $x = {}^3\log 60$

b.  $5^{x-1} + 5^{2x-1} = 4$   
 $5^{-1} \cdot 5^x + 5^{-1} \cdot 5^{2x} = 4$   
 $\frac{1}{5} \cdot 5^x + \frac{1}{5} \cdot (5^x)^2 = 4$   
 stel  $p = 5^x$  dan  $\frac{1}{5}p + \frac{1}{5}p^2 = 4$   
 $\frac{1}{5}p^2 + \frac{1}{5}p - 4 = 0$   
 $p^2 + p - 20 = 0$   
 $(p+5)(p-4) = 0$   
 $p = -5 \quad \vee \quad p = 4$   
 $5^x = -5 \quad \vee \quad 5^x = 4$   
 k.n.  $x = {}^5\log 4$

c.  $3^x + 5 \cdot (\frac{1}{3})^{x-2} = 18$   
 $3^x + 5 \cdot (3^{-1})^{x-2} = 18$

$$3^x + 5 \cdot 3^{-x+2} = 18$$

$$3^x + 5 \cdot \frac{3^2}{3^x} = 18$$

$$3^x + \frac{45}{3^x} = 18$$

$$\text{stel } p = 3^x \text{ dan } p + \frac{45}{p} = 18$$

$$p^2 + 45 = 18p$$

$$p^2 - 18p + 45 = 0$$

$$(p-3)(p-15) = 0$$

$$p = 3 \quad \vee \quad p = 15$$

$$3^x = 3 \quad \vee \quad 3^x = 15$$

$$x = 1 \quad \vee \quad x = {}^3\log 15$$

d.  $3^x + 2 \cdot \left(\frac{1}{3}\right)^{x-2} = 1$

$$3^x + 2 \cdot (3^{-1})^{x-2} = 1$$

$$3^x + 2 \cdot 3^{-x+2} = 1$$

$$3^x + 2 \cdot \frac{3^2}{3^x} = 1$$

$$3^x + \frac{18}{3^x} = 1$$

$$\text{stel } p = 3^x \text{ dan } p + \frac{18}{p} = 1$$

$$p^2 + 18 = p$$

$$p^2 - p + 18 = 0$$

$$p = \frac{1 \pm \sqrt{-71}}{2} = \text{k.n.}$$

dus geen oplossingen