

Lösungen E+M Analysis 5 - 6

Uebung 1

a

Out[2]= 0

b

Out[4]= 2

c

Out[5]= $\frac{2}{3}$

Out[6]= $\frac{2}{3} - \frac{2}{3(1+3n^2)}$

d

Out[7]= 0

Out[8]= $-\frac{1}{2n^2} + \frac{3}{2n} + \frac{1+5n}{2(-2+n^2)}$

e

Out[9]= 0

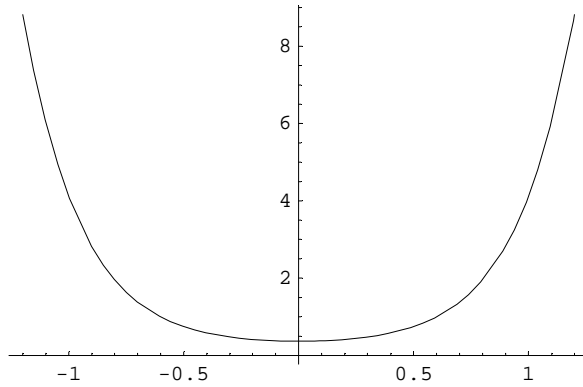
f

Out[10]= 1

In[11]:=

Uebung 2

f ist Gerade



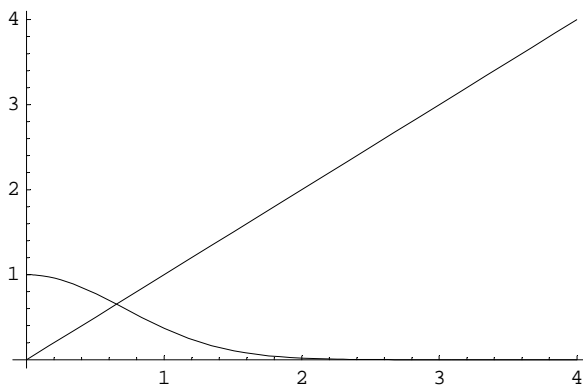
Uebung 3

a

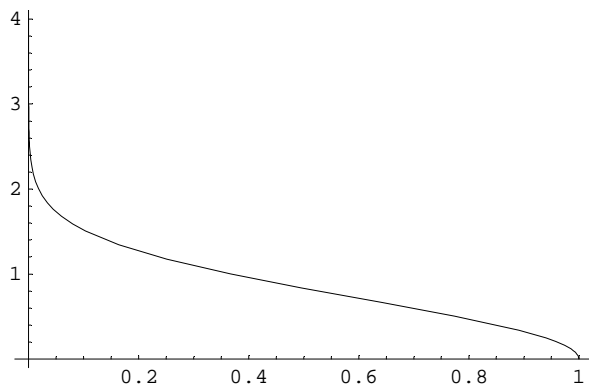
$$\text{Out}[99]= e^{-x^2}$$

$$\text{Out}[95]= \{x \rightarrow -i \sqrt{\text{Log}[y]}, x \rightarrow i \sqrt{\text{Log}[y]}\}$$

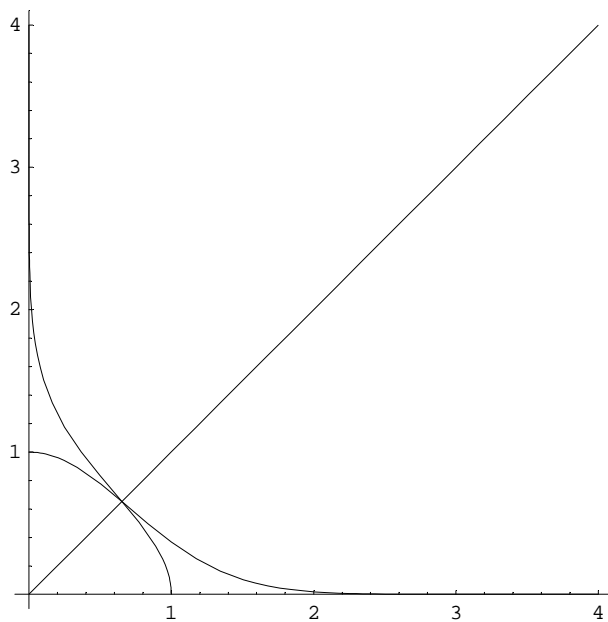
Funktion



Umkehrfunktion: Variablen tauschen bei ParametricPlot



Funktion und Umkehrfunktion



b

Löse $f(x) = 0.5$

`Out[18]= {x -> 0.832555}`

Uebung 4

`Out[21]= 0`

Uebung 5

a

$$\text{Out}[24]= \frac{1}{2} \sqrt{3} \cos[x] + \frac{\sin[x]}{2}$$

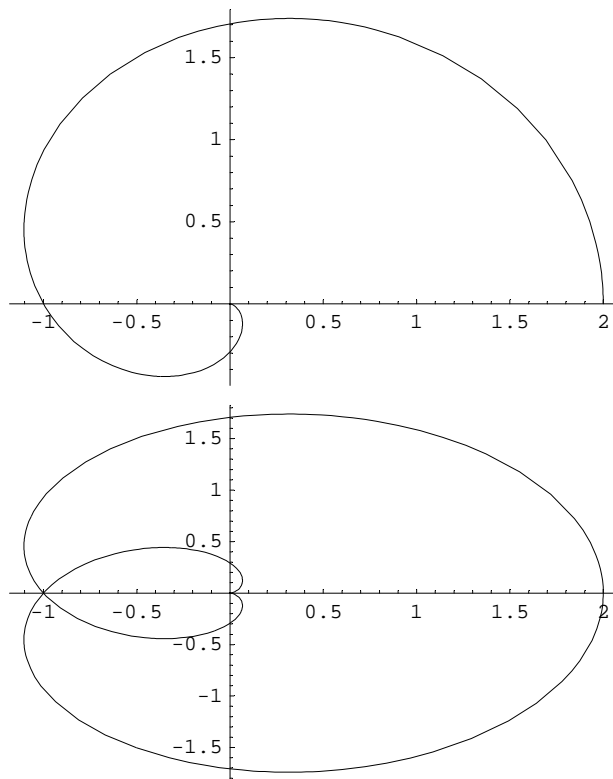
b

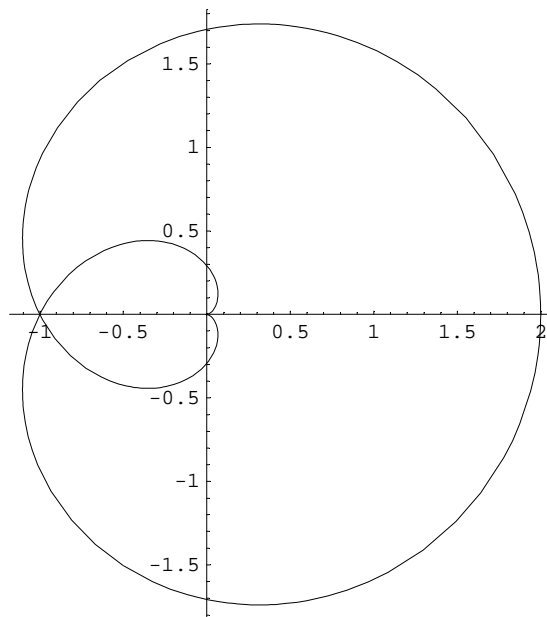
$$\text{Out}[27]= \frac{\frac{1}{2} \sqrt{3} \cos[x] + \frac{\sin[x]}{2}}{\frac{1}{4} + \sin[x]^2}$$

$$\text{Out}[28]= -\frac{2(\sqrt{3} \cos[x] + \sin[x])}{-3 + 2 \cos[2x]}$$

Uebung 6

a



b

Uebung 7

Out[100]=

$$\left\{x \rightarrow \frac{\text{Log}[2]}{\text{Log}\left[\frac{5}{3}\right]}\right\}$$

Out[34]= {{x → 1.35692}}

Uebung 8

Out[104]=

$$\left\{x \rightarrow \frac{367}{999}\right\}$$

Out[105]=

$$\{a \rightarrow 0.367367\}$$

Uebung 9

Out[37]= 0

Uebung 10

Out[38]= 0

Uebung 11

`Out[39]= 0`

Uebung 12

`Out[40]= 6`

Uebung 13

`Out[41]= 1`

Uebung 14

`Out[42]= 0`

Uebung 15

`Out[106]=`
`0`

Uebung 16

`Out[44]= 0.`

Uebung 17

`Out[45]= $\frac{47}{4}$`

Uebung 18

`Out[46]= 5`

Uebung 19

`Out[47]= ∞`

Uebung 20

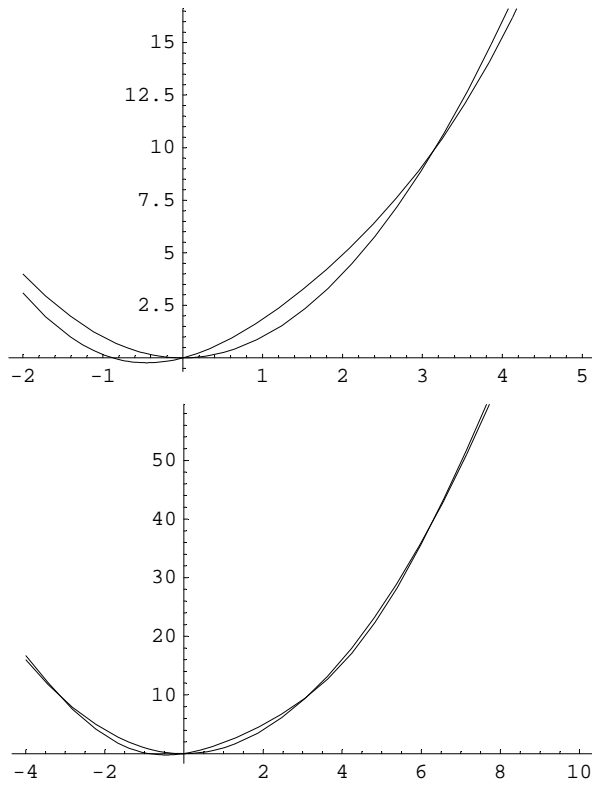
`Out[48]= $\frac{3}{2}$`

`In[49]:=`

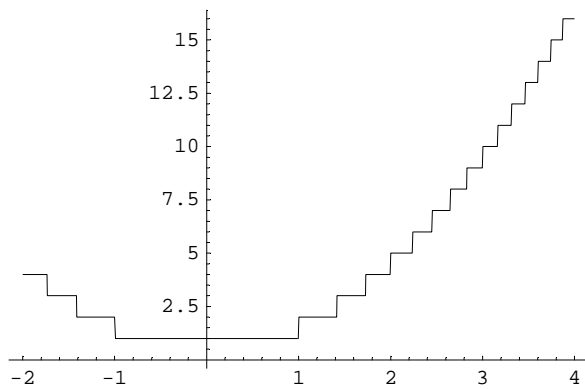
Uebung 21

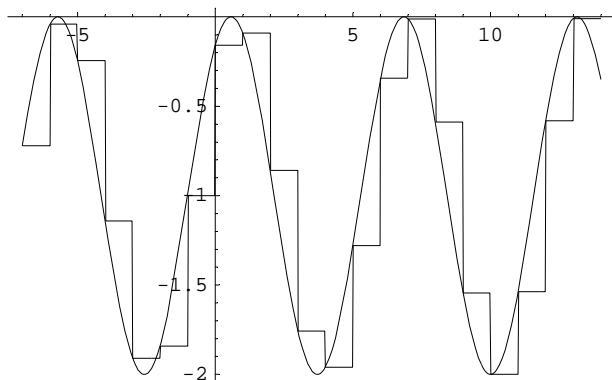
a

$x^2 + \sin[x]$ und x^2



b



c**Sin[Floor[x+1]]-1 und Sin[x+1]-1**`In[55]:=`

Uebung 22

a`Out[108]=`

$$\{x \rightarrow 2(1 - \sqrt{2}), x \rightarrow 2(1 + \sqrt{2})\}$$

`Out[109]=`

$$\{x \rightarrow -0.828427, x \rightarrow 4.82843\}$$

`x > 4 x 4.828...., x Q`**b**`Out[110]=`

$$\{x \rightarrow \frac{1}{2}(7 - \sqrt{21}), x \rightarrow \frac{1}{2}(7 + \sqrt{21})\}$$

`Out[111]=`

$$\{x \rightarrow 1.20871, x \rightarrow 5.79129\}$$

`x > 5 x 5.791...., x Q``In[57]:=`

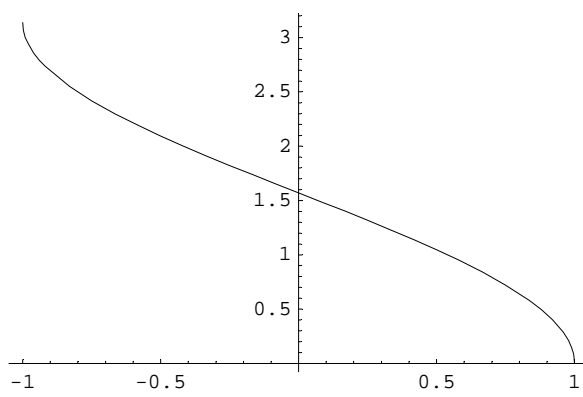
Uebung 23

a

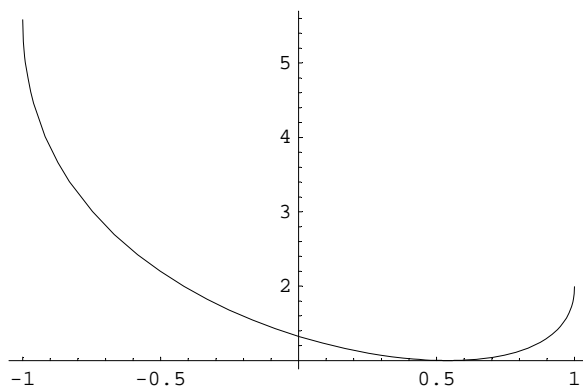
h(x)

`Out[58]= 2 - 2 ArcCos[x] + ArcCos[x]^2`

f(x)



h(x)



b

{h(-1), h(-1) numerisch}

`Out[61]= {2 - 2 π + π^2, 5.58642}`

h(1)

Out[62]= 2

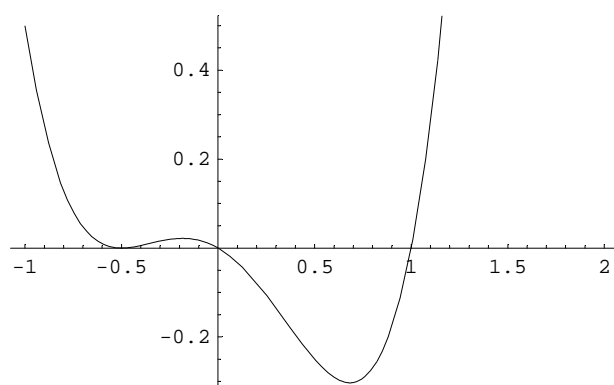
 $D_h = [-1, 1], W_h = [0, h(-1)]$

C**{h(0), h(0) numerisch}**Out[63]= $\left\{2 - \pi + \frac{\pi^2}{4}, 1.32581\right\}$ **h(1)**

Out[64]= 2

In[65]:=

Uebung 24

a**h(x)**Out[67]= $(-x + x^2) \left(\frac{1}{4} + x + x^2\right)$ **Nullstellen von h**

Out[115]=

 $\left\{x \rightarrow -\frac{1}{2}, x \rightarrow -\frac{1}{2}, x \rightarrow 0, x \rightarrow 1\right\}$

Nullstellen von f

Out[116]=

$$\left\{x \rightarrow -\frac{1}{2}, x \rightarrow -\frac{1}{2}\right\}$$

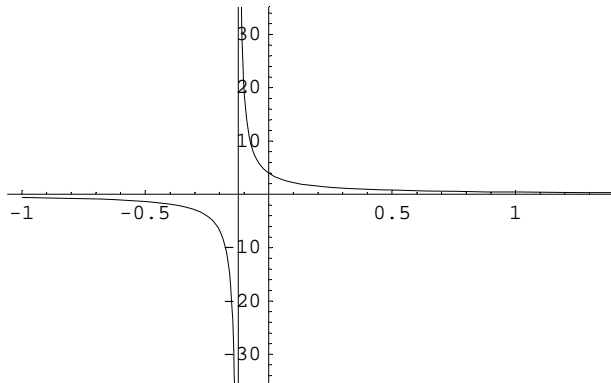
Nullstellen von g

Out[117]=

$$\{x \rightarrow 0, x \rightarrow 1\}$$

b

$$\text{Out}[72]= \frac{1}{\frac{1}{4} + 2x}$$



Polstelle/ Place du pôle

Out[119]=

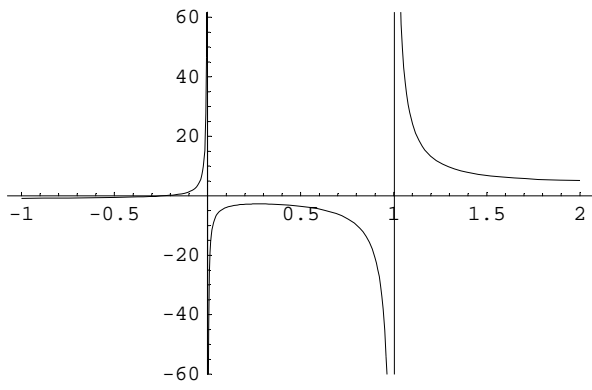
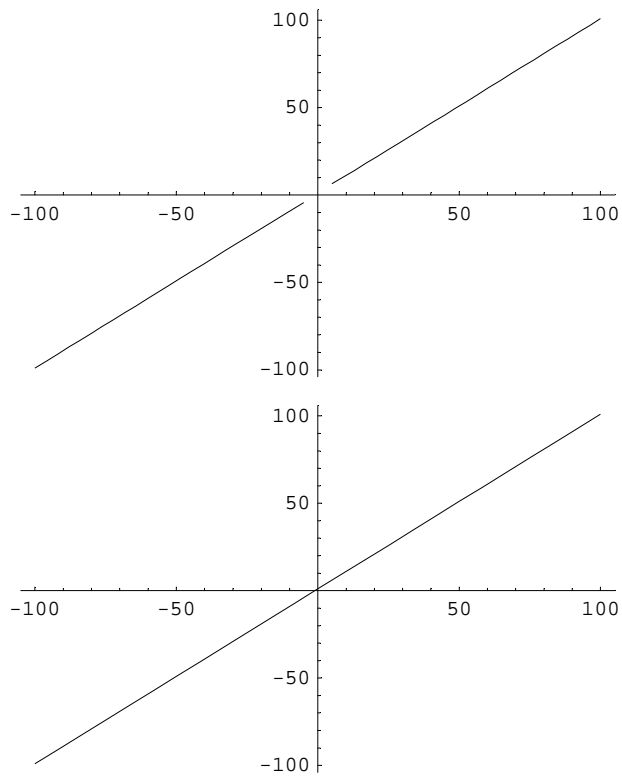
$$\left\{x \rightarrow -\frac{1}{8}\right\}$$

In[75]:=

Uebung 25**a****h**

$$\text{Out}[76]= x + \frac{\frac{1}{4} + x + x^2}{(-1 + x)x}$$

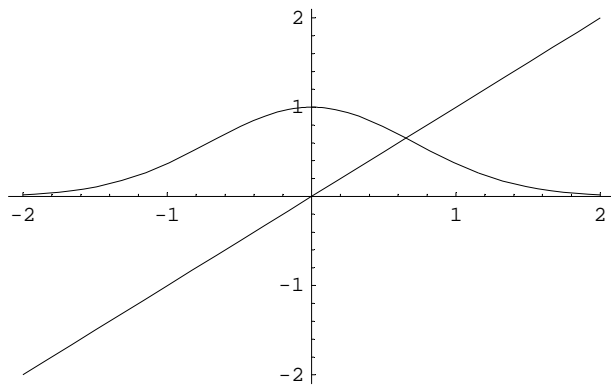
$$\text{Out}[77]= 1 + \frac{9}{4(-1 + x)} - \frac{1}{4x} + x$$

**b****h und $y = x+1$** `In[81]:=`

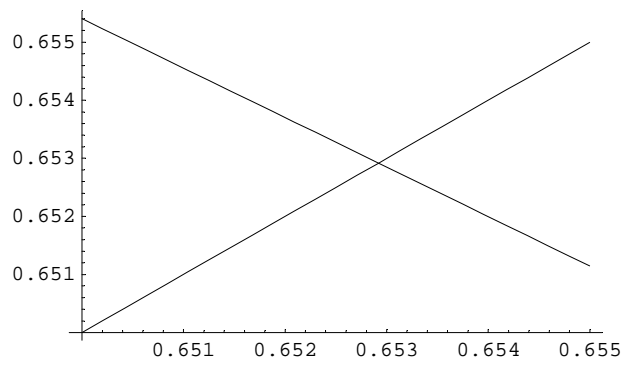
Uebung 26

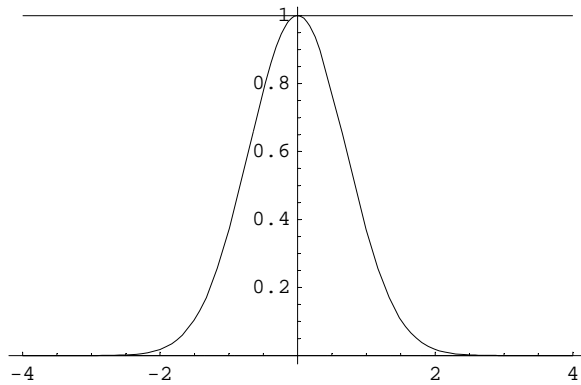
Ablesbar im Diagramm!

a



b



c**m = 0; M = 1;****d****{f[0], f[Log[E]], f[1]}**

```
Out[87]= {1, 1/e, 1/e}
```

```
Out[88]= {1., 0.367879, 0.367879}
```

```
In[89]:=
```

Uebung 27

```
Out[120]=
```

$$3^x = \left(\frac{4}{9}\right)^x e^3$$

```
Out[124]=
```

```
{x -> 1.57106}
```

```
Out[92]= \left(\frac{27}{4}\right)^x = e^3
```

x Log[27/4] 3

```
Out[125]=
```

$$\left\{x \rightarrow \frac{3}{\text{Log}\left[\frac{27}{4}\right]}\right\}$$

```
Out[126]=
```

```
{x -> 1.57106}
```

Uebung 28

$$I = 2 (1/2^0 + 1/2^1 + 1/2^2 + 1/2^3 + \dots)$$

Out[127]=
4

$$\begin{aligned} A &= 2 * 1/2 + 2/2 * 1/2/2 + 2/2^2 * 1/2/2^2 + \dots \\ &= 2 * 1/2 * (1 + 1/2 * 1/2 + 1/2^2 * 1/2^2 + 1/2^3 * 1/2^3 + \dots) \\ &= 2 * 1/2 * (1 + 1/4 + 1/4^2 + 1/4^3 + \dots) \end{aligned}$$

Out[129]=
 $\frac{4}{3}$

In[131]:=

Uebung 29

4

Uebung 30

f(x)

Out[132]=
 $a (-2 + x) x (2 + x)$

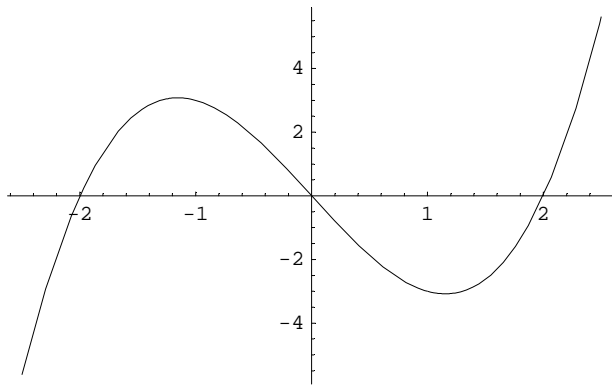
f(x6) = 48

Out[133]=
48 a == 48

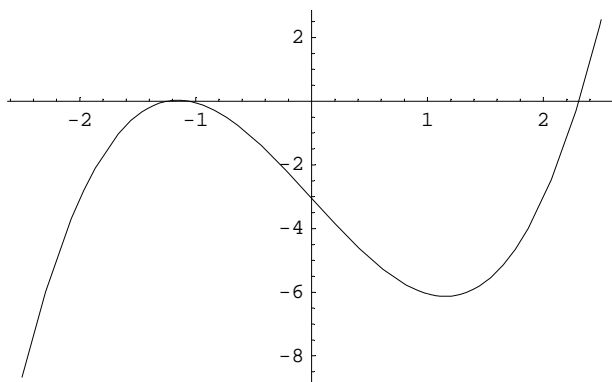
Out[134]=
{a → 1}

f(x) nachher: f(x) = (x-x1)(x-x3)(x-x5)

Out[135]=
 $-4 x + x^3$



Annäherung / Approximation: $f(x) - 3.05$



$f(x) - 3.05 = 0$

Out[138]=
 $\{x \rightarrow -1.24534, x \rightarrow -1.06163, x \rightarrow 2.30696\}$

$f(x) - 3.075 = 0$

Out[139]=
 $\{x \rightarrow -1.18935, x \rightarrow -1.1197, x \rightarrow 2.30905\}$

Uebung 31

$$3 + 3/2^2 + 3/2^4 + \dots = 3((1/2^2)^0 + (1/2^2)^1 + (1/2^2)^2) + \dots$$

Out[140]=
 4

$$5/2 + 5/2^3 + 5/2^5 + \dots = 5/2 ((1/2^2)^0 + (1/2^2)^1 + (1/2^2)^2) + \dots$$

Out[142]=
 $\frac{10}{3}$

Produkt

Out[145]=
 $\frac{40}{3}$

Out[146]=
13.3333

In[147]:=

Uebung 32

$2^0 = 3^0 = 1 \implies k=0 \dots \text{Infinity}$

Out[147]=
 $\frac{1}{2}$