MP06 Bau1 -
Lösungen / ähnliche Lösungen /
Lösungen von ev. weiteren Aufgaben

1 Differenzieren und integrieren

a Resultat so kurz wie möglich halten

```
f[x_]:=x^2+ 0.5 Sin[x];
f[x]
```

$$x^2 + 0.5\,\text{Sin}[x]$$

```
f'[x]
```

$$2\,x + 0.5\,\text{Cos}[x]$$

```
f'[x]/.x->1
```

```
2.27015
```

```
ArcTan[f'[x]/.x->1]
```

```
1.15587
```

```
ArcTan[f'[x]/.x->1]/Degree
```

```
66.2265
```

```
f''[x]/.x->1
```

```
1.57926
```

b Resultat so kurz wie möglich halten

```
f[x_]:=(((x^(3/4)-3)^3)^(1/4))^5
```

```
f[x]
```

$$\left(\left(-3 + x^{3/4}\right)^3\right)^{5/4}$$

```
D[f[x],x]//Simplify
```

$$\frac{45\,\left(-3 + x^{3/4}\right)^2\,\left(\left(-3 + x^{3/4}\right)^3\right)^{1/4}}{16\,x^{1/4}}$$

D[f[x],x]//Expand

$$\frac{405\left(\left(-3+x^{3/4}\right)^3\right)^{1/4}}{16\,x^{1/4}}-\frac{135}{8}\left(\left(-3+x^{3/4}\right)^3\right)^{1/4}\sqrt{x}+\frac{45}{16}\left(\left(-3+x^{3/4}\right)^3\right)^{1/4}x^{5/4}$$

c Resultat so kurz wie möglich halten

f[x_]:= 4 x^2 Sin[3x^2-2]

f[x]

$$-4\,x^2\,\text{Sin}[2-3\,x^2]$$

D[f[x],x]//Simplify

$$24\,x^3\,\text{Cos}[2-3\,x^2]-8\,x\,\text{Sin}[2-3\,x^2]$$

D[f[x],x]//Expand

$$24\,x^3\,\text{Cos}[2-3\,x^2]-8\,x\,\text{Sin}[2-3\,x^2]$$

d Resultat so kurz wie möglich halten

f[x_]:= Log[x/(1-x)] (x/(1-x))

f[x]

$$\frac{x\,\text{Log}\left[\frac{x}{1-x}\right]}{1-x}$$

D[f[x],x]//Simplify

$$\frac{1+\text{Log}\left[\frac{x}{1-x}\right]}{(-1+x)^2}$$

D[f[x],x]//Expand

$$\frac{1}{1-x}+\frac{x}{(1-x)^2}+\frac{\text{Log}\left[\frac{x}{1-x}\right]}{1-x}+\frac{x\,\text{Log}\left[\frac{x}{1-x}\right]}{(1-x)^2}$$

e Resultat so kurz wie möglich halten

f[x_]:= 4 E^(-x) Cos[2-E^x]

f[x]

$$4\,e^{-x}\,\text{Cos}[2-e^x]$$

D[f[x],x]//Simplify

$$-4\,e^{-x}\,\text{Cos}[2-e^x]+4\,\text{Sin}[2-e^x]$$

D[f[x],x]//Expand

$$-4\,e^{-x}\,\text{Cos}[2-e^x]+4\,\text{Sin}[2-e^x]$$

f Resultat so kurz wie möglich halten

```
Remove[a]

f[x_]:= x^2+a Sin[x]+2/x

Integrate[f[x],{x,1,E^2}]
```

$$\frac{1}{3}\left(11+e^6+3\,a\,\text{Cos}[1]-3\,a\,\text{Cos}[e^2]\right)$$

```
Integrate[f[x],{x,1,E^2}]//Expand
```

$$\frac{11}{3}+\frac{e^6}{3}+a\,\text{Cos}[1]-a\,\text{Cos}[e^2]$$

```
N[%]//Expand
```

$$138.143+0.0919461\,a$$

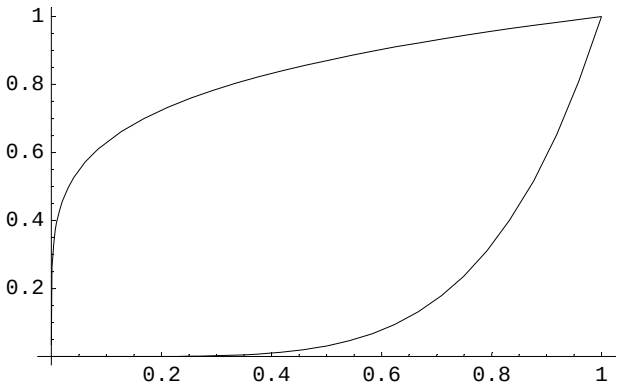
---

2 Kurven und Flächen

Gegeben sei die Kurvenschar y=x^a auf I=[0,1]

a Plot

```
Plot[{x^5,x^(1/5)},{x,0,1}];
```



b y=x^(a) soll die eingeschlossenen Fläche halbieren. Berechne a

```
r1=Evaluate[Integrate[x^5-x^(a),{x,0,1}]==Integrate[x^(a)-x^(1/5),{x,0,1}]][[1]][[2
]];
r2=Evaluate[Integrate[x^5-x^(a),{x,0,1}]==Integrate[x^(a)-x^(1/5),{x,0,1}]][[2]][[2
]];
h=(r1==r2)
```

$$\frac{1}{6}-\frac{1}{1+a}==-\frac{5}{6}+\frac{1}{1+a}$$

```
Solve[h,{a}]
```

$$\{\{a \to 1\}\}$$

```
r1=Evaluate[Integrate[x^5-x^(a),{x,0,1}]==Integrate[x^(a)-x^(1/5),{x,0,1}]][[1]][[2
]];
r2=Evaluate[
Integrate[x^5-x^(a),{x,0,1}]==Integrate[x^(a)-x^(1/5),{x,0,1}]][[2]][[2]];
h=(r1==3 r2)
```

$$\frac{1}{6} - \frac{1}{1+a} == 3\left(-\frac{5}{6} + \frac{1}{1+a}\right)$$

```
Solve[h,{a}]
```

$$\left\{\left\{a \to \frac{1}{2}\right\}\right\}$$

```
r1=Evaluate[Integrate[x^5-x^(a),{x,0,1}]==Integrate[x^(a)-x^(1/5),{x,0,1}]][[1]][[2
]];
r2=Evaluate[
Integrate[x^5-x^(a),{x,0,1}]==Integrate[x^(a)-x^(1/5),{x,0,1}]][[2]][[2]];
h=(r1==(Sqrt[5]+1)/2 r2)
```

$$\frac{1}{6} - \frac{1}{1+a} == \frac{1}{2}\left(1+\sqrt{5}\right)\left(-\frac{5}{6} + \frac{1}{1+a}\right)$$

```
solv1=Solve[h,{a}]//Flatten
```

$$\left\{a \to \frac{11+\sqrt{5}}{7+5\sqrt{5}}\right\}$$

```
N[%]
```

$$\{a \to 0.728043\}$$

```
r3=Evaluate[Integrate[x^5-x^(a),{x,0,1}]==Integrate[x^(a)-x^(1/5),{x,0,1}]][[1]][[2
]];
r4=Evaluate[
Integrate[x^5-x^(a),{x,0,1}]==Integrate[x^(a)-x^(1/5),{x,0,1}]][[2]][[2]];
h=(r3==(Sqrt[5]-1)/2 r2)
```

$$\frac{1}{6} - \frac{1}{1+a} == \frac{1}{2}\left(-1+\sqrt{5}\right)\left(-\frac{5}{6} + \frac{1}{1+a}\right)$$

```
N[%]
```

$$0.166667 - \frac{1.}{1.+a} == 0.618034\left(-0.833333 + \frac{1}{1.+a}\right)$$

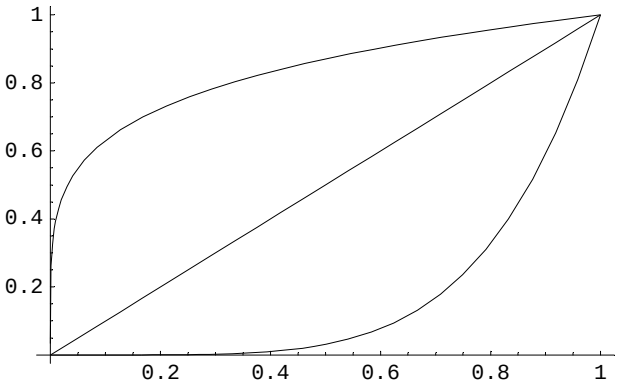
```
solv2=Solve[h,{a}]//Flatten
```

$$\left\{a \to \frac{9+\sqrt{5}}{-3+5\sqrt{5}}\right\}$$

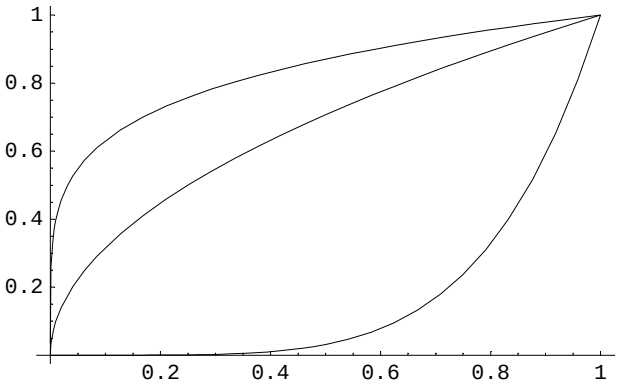
```
N[%]
```

$$\{a \to 1.37355\}$$

```
Plot[{x^5,x^(1/5),x^1},{x,0,1}];
```

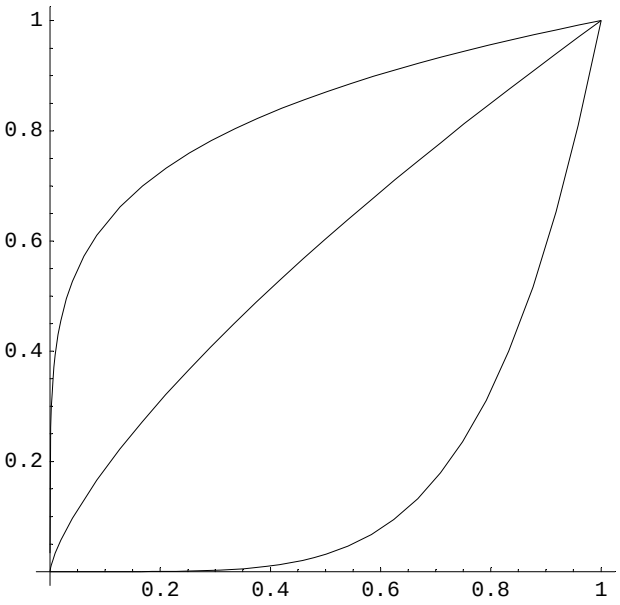



```
Plot[{x^5,x^(1/5),x^(1/2)},{x,0,1}];
```

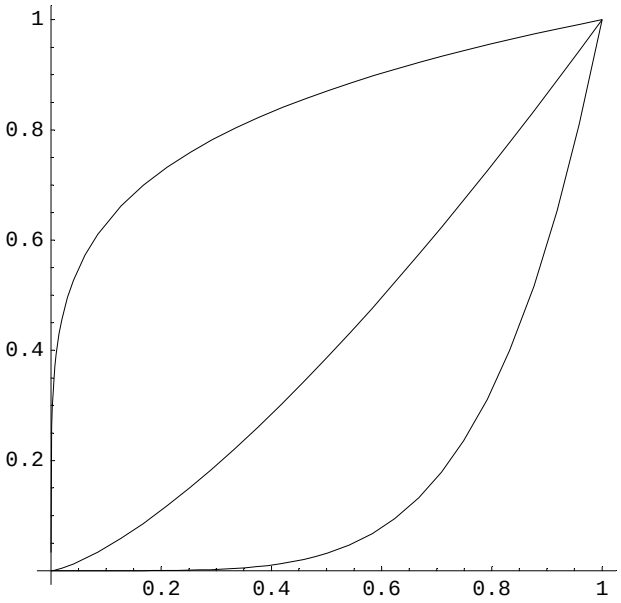


Plot Goldener Schnitt

```
Plot[Evaluate[{x^5,x^(1/5),x^(a)/.solv1}],{x,0,1},AspectRatio->Automatic];
```



```
Plot[Evaluate[{x^5,x^(1/5),x^(a)/.solv2}],{x,0,1},AspectRatio->Automatic];
```



3 Rotationskörper, Parabel

Funktion durch Parabel angenähert. Gleiche Ableitung bei -1 und Werte bei -1 und 1, Winkelabweichung bei 1?

```
f[x_]:=(x^2-1) E^(-x);
p[x_,a_,b_,c_]:=a x^2+b x + c
```

```
f'[x]/.x->-1
```

$$-2\,e$$

```
solv=Solve[Evaluate[{p[-1,a,b,c]==0, p[1,a,b,c]==0,
(D[p[x,a,b,c],x]==f'[x]/.x->-1)}]]//Flatten
```

$$\{a \to e,\ b \to 0,\ c \to -e\}$$

```
%//N
```

$$\{a \to 2.71828,\ b \to 0.,\ c \to -2.71828\}$$

```
p[x_]:=a x^2+b x + c/.solv; p[x]
```

$$-e + e\,x^2$$

```
p'[x]/.x->1
```

$$2\,e$$

```
f'[x]/.x->1
```

$$\frac{2}{e}$$

```
ArcTan[2 E]-ArcTan[2/ E] //N
```

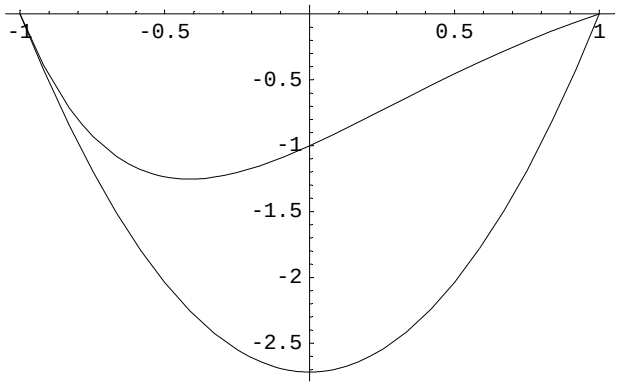
$$0.754566$$

```
(ArcTan[2 E]-ArcTan[2/ E]) /Degree//N
```

```
43.2334
```

a Plot

```
Plot[{f[x],p[x]},{x,-1,1}];
```



Flächenverhältnis

```
Integrate[(x^2-1) E^(-x),x]
```

$$-e^{-x}\,(1+x)^2$$

```
Integrate[(x^2-1) E^(-x),{x,-1,1}]
```

$$-\frac{4}{e}$$

```
%//N
```

```
-1.47152
```

```
Integrate[p[x],x]
```

$$-e\,x+\frac{e\,x^3}{3}$$

```
Integrate[p[x],{x,-1,1}]
```

$$-\frac{4\,e}{3}$$

```
%//N
```

```
-3.62438
```

```
int=Integrate[(f[x]-p[x]),{x,-1,1}]/Integrate[(p[x]),{x,-1,1}]
```

$$-\frac{3\,\left(-\frac{4}{e}+\frac{4\,e}{3}\right)}{4\,e}$$

```
int//N
```

```
-0.593994
```

```
Integrate[(f[x]),{x,-1,1}]/Integrate[(p[x]),{x,-1,1}]
```

$$\frac{3}{e^2}$$

```
%//N
```

```
0.406006
```

```
1/%//N
```

```
2.46302
```

Wendepunkt

```
Evaluate[f''[x]]/.x->0
```

```
1
```

```
Solve[Evaluate[f''[x]==0],{x}]
```

```
Solve::ifun : Inverse functions are being used by Solve, so some
   solutions may not be found; use Reduce for complete solution information. Mehr…
```

$$\left\{\left\{x \to 2 - \sqrt{3}\right\}, \left\{x \to 2 + \sqrt{3}\right\}\right\}$$

```
Solve::ifun : Inverse functions are being used by Solve, so some
   solutions may not be found; use Reduce for complete solution information. Mehr…
```

$$\left\{\left\{x \to 2 - \sqrt{3}\right\}, \left\{x \to 2 + \sqrt{3}\right\}\right\}$$

```
Solve[Evaluate[f''[x]==0],{x}]//N
```

```
Solve::ifun : Inverse functions are being used by Solve, so some
   solutions may not be found; use Reduce for complete solution information. Mehr…
```

```
{{x → 0.267949}, {x → 3.73205}}
```

Rotationsvolunen bei Parabe, Vergleich mit Zylinder gleicher Länge, r = ? (Hat Volumen in Zylinder mit r=2 Platz?)

```
Pi Integrate[p[x]^2,{x,-1,1}]
```

$$\frac{16\, e^2\, \pi}{15}$$

```
%//N
```

```
24.761
```

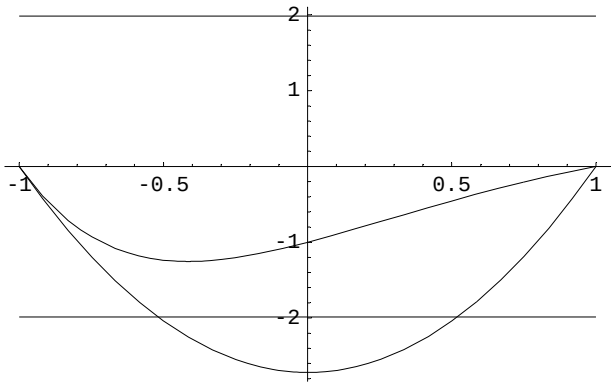
```
Sqrt[Integrate[p[x]^2,{x,-1,1}]/2]
```

$$2\sqrt{\frac{2}{15}}\ e$$

```
%//N
```

```
1.98515
```

```
Plot[{f[x],p[x],-1.9851,1.9851},{x,-1,1}];
```



Länge der Bögen:

```
{f[x],p[x]}
```

$$\{e^{-x}\,(-1+x^2),\ -e+e\,x^2\}$$

```
l1=NIntegrate[Evaluate[Sqrt[1+D[p[x],x]^2]],{x,-1,1}]
```

```
5.96824
```

```
l2=NIntegrate[Evaluate[Sqrt[1+D[f[x],x]^2]],{x,-1,1}]
```

```
3.37052
```

```
l3=2
```

```
2
```

```
l1/l2
```

```
1.77072
```

```
l1/l3
```

```
2.98412
```

```
l2/l3
```

```
1.68526
```

3 Rotationskörper, Parabel mit Punkteverwechslung

Funktion durch Parabel angenähert. Gleiche Ableitung bei -1 und Werte bei -1 und 1, Winkelabweichung bei 1?

```
f[x_]:=(x^2-1) E^(-x);
p[x_,a_,b_,c_]:=a x^2+b x + c
```

```
f'[x]/.x->1
```

$$\frac{2}{e}$$

```
solv=Solve[Evaluate[{p[-1,a,b,c]==0, p[1,a,b,c]==0,
(D[p[x,a,b,c],x]==f'[x]/.x->1)}]]//Flatten
```

$$\left\{c \to -\frac{1}{e},\ a \to \frac{1}{e},\ b \to 0\right\}$$

```
%//N
```

$$\{c \to -0.367879,\ a \to 0.367879,\ b \to 0.\}$$

```
p[x_]:=a x^2+b x + c/.solv; p[x]
```

$$-\frac{1}{e} + \frac{x^2}{e}$$

```
p'[x]/.x->1
```

$$\frac{2}{e}$$

```
f'[x]/.x->1
```

$$\frac{2}{e}$$

```
ArcTan[2 E]-ArcTan[2/ E] //N
```

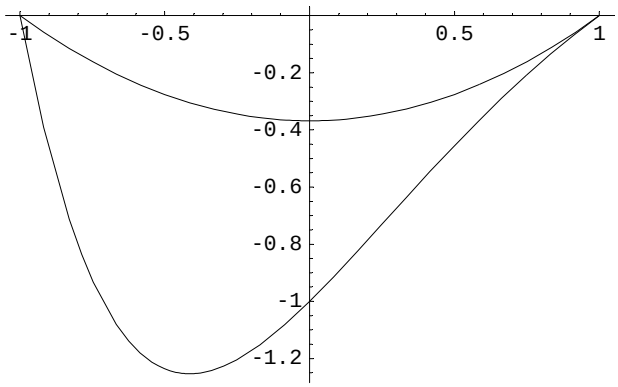
```
0.754566
```

```
(ArcTan[2 E]-ArcTan[2/ E]) /Degree//N
```

```
43.2334
```

a Plot

```
Plot[{f[x],p[x]},{x,-1,1}];
```



Flächenverhältnis

```
Integrate[(x^2-1) E^(-x),x]
```

$$-e^{-x}\ (1+x)^2$$

```
Integrate[(x^2-1) E^(-x),{x,-1,1}]
```

$$-\frac{4}{e}$$

%//N

-1.47152

Integrate[p[x],t]

$$\frac{t\,(-1+x^2)}{e}$$

Integrate[p[x],{x,-1,1}]

$$-\frac{4}{3\,e}$$

%//N

-0.490506

int=Integrate[(f[x]-p[x]),{x,-1,1}]/Integrate[(p[x]),{x,-1,1}]

2

int//N

2.

Integrate[(f[x]),{x,-1,1}]/Integrate[(p[x]),{x,-1,1}]

3

%//N

3.

1/%//N

0.333333

Wendepunkt

Evaluate[f''[x]]/.x->0

1

Solve[Evaluate[f''[x]==0],{x}]

Solve::ifun : Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information. Mehr…

$$\left\{\left\{x\to 2-\sqrt{3}\right\},\ \left\{x\to 2+\sqrt{3}\right\}\right\}$$

Solve[Evaluate[f''[x]==0],{x}]//N

Solve::ifun : Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information. Mehr…

$\{\{x\to 0.267949\},\ \{x\to 3.73205\}\}$

Rotationsvolunen bei Parabe, Vergleich mit Zylinder gleicher Länge, r = ? (Hat Volumen in Zylinder mit r=2 Platz?)

Pi Integrate[p[x]^2,{x,-1,1}]

$$\frac{16\,\pi}{15\,e^2}$$

%//N

0.453513

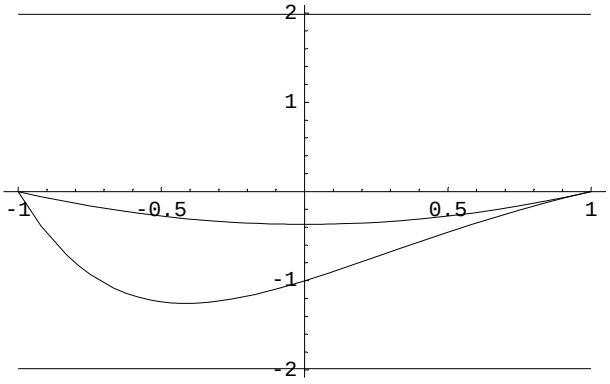
Sqrt[Integrate[p[x]^2,{x,-1,1}]/2]

$$\frac{2\sqrt{\frac{2}{15}}}{e}$$

%//N

0.268661

Plot[{f[x],p[x],-1.9851,1.9851},{x,-1,1}];



Länge der Bögen:

{f[x],p[x]}

$$\left\{e^{-x}\,(-1+x^2),\ -\frac{1}{e}+\frac{x^2}{e}\right\}$$

l1=NIntegrate[Evaluate[Sqrt[1+D[p[x],x]^2]],{x,-1,1}]

2.16805

l2=NIntegrate[Evaluate[Sqrt[1+D[f[x],x]^2]],{x,-1,1}]

3.37052

l3=2

2

l1/l2

0.643241

l1/l3

```
1.08403
```

l2/l3

```
1.68526
```

4 Annäherung Hügel durch Potenzreihe

Funktion durch Parabel angenähert. Gleiche Ableitung bei -1 und Werte bei -1 und 1, Winkelabweichung bei 1?

Test

```
Remove["Global`*"]
```

```
q[x_,a_,b_,c_,d_,e_]:=(a x^2+b x + c)/(x^2+d x+e)
```

```
q[x,a,b,c,d,e]//TeXForm
```

```
\frac{a x^2+b x+c}{x^2+d x+e}
```

```
sys={
q[-2,a,b,c,d,e]==0,
q[2,a,b,c,d,e]==0,
q[0,a,b,c,d,e]==2,
(D[q[x,a,b,c,d,e],x]/.x->1)==-1,
(D[q[x,a,b,c,d,e],x]/.x->-1)==1}
```

$$\left\{\frac{4\,a-2\,b+c}{4-2\,d+e}==0,\ \frac{4\,a+2\,b+c}{4+2\,d+e}==0,\ \frac{c}{e}==2,\ -\frac{(a+b+c)\,(2+d)}{(1+d+e)^2}+\frac{2\,a+b}{1+d+e}==-1,\ -\frac{(a-b+c)\,(-2+d)}{(1-d+e)^2}+\frac{-2\,a+b}{1-d+e}==1\right\}$$

```
solv=Solve[Evaluate[sys,{a,b,c,d,e}]]
```

$$\left\{\left\{b\to 0,\ c\to 1,\ a\to -\frac{1}{4},\ d\to 0,\ e\to \frac{1}{2}\right\},\ \left\{b\to 0,\ c\to 8,\ a\to -2,\ d\to -\sqrt{7},\ e\to 4\right\},\ \left\{b\to 0,\ c\to 8,\ a\to -2,\ d\to \sqrt{7},\ e\to 4\right\}\right\}$$

```
q[x_]:=(a x^2+b x + c)/(x^2+d x+e)/.solv ; q[x]
```

$$\left\{\frac{1-\frac{x^2}{4}}{\frac{1}{2}+x^2},\ \frac{8-2\,x^2}{4-\sqrt{7}\,x+x^2},\ \frac{8-2\,x^2}{4+\sqrt{7}\,x+x^2}\right\}$$

Symmetrie

```
Remove["Global`*"]
```

```
q[x_,a_,c_,e_]:=(a x^2+ c)/(x^2+e)
```

```
sys={
q[2,a,c,e]==0,
q[0,a,c,e]==2,
(D[q[x,a,c,e],x]/.x->1)==-1}
```

$$\left\{\frac{4\,a+c}{4+e}==0,\ \frac{c}{e}==2,\ -\frac{2\,(a+c)}{(1+e)^2}+\frac{2\,a}{1+e}==-1\right\}$$

```
solv=Solve[Evaluate[sys,{a,c,e}]]//Flatten
```

$$\left\{c\to 1,\ a\to -\frac{1}{4},\ e\to \frac{1}{2}\right\}$$

```
q[x_]:=(a x^2+ c)/(x^2+e)/.solv ; q[x]
```

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

```
q[x]//Simplify
```

$$\frac{4-x^2}{2+4\,x^2}$$

Konvergenzbereich: Partialbruchzerlegung, Vergleich mit geometrischer Reihe! ==> r = 1

```
q1[x_]:= Evaluate[q[x]//Apart]; q1[x]
```

$$-\frac{1}{4}+\frac{9}{4\,(1+2\,x^2)}$$

```
Table[D[q1[x],{x,k}],{k,0,10}]//Together
```

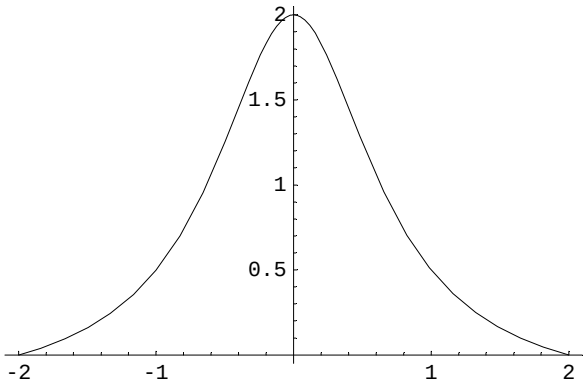
$$\left\{\frac{4-x^2}{2\,(1+2\,x^2)},\ -\frac{9\,x}{(1+2\,x^2)^2},\ \frac{9\,(-1+6\,x^2)}{(1+2\,x^2)^3},\ -\frac{216\,(-x+2\,x^3)}{(1+2\,x^2)^4},\right.$$
$$\frac{216\,(1-20\,x^2+20\,x^4)}{(1+2\,x^2)^5},\ -\frac{4320\,(3\,x-20\,x^3+12\,x^5)}{(1+2\,x^2)^6},\ \frac{12960\,(-1+42\,x^2-140\,x^4+56\,x^6)}{(1+2\,x^2)^7},$$
$$-\frac{1451520\,(-x+14\,x^3-28\,x^5+8\,x^7)}{(1+2\,x^2)^8},\ \frac{1451520\,(1-72\,x^2+504\,x^4-672\,x^6+144\,x^8)}{(1+2\,x^2)^9},$$
$$-\frac{52254720\,(5\,x-120\,x^3+504\,x^5-480\,x^7+80\,x^9)}{(1+2\,x^2)^{10}},$$
$$\left.\frac{261273600\,(-1+110\,x^2-1320\,x^4+3696\,x^6-2640\,x^8+352\,x^{10})}{(1+2\,x^2)^{11}}\right\}$$

```
Table[D[q1[x],{x,k}],{k,0,10}]/.x->1.
```

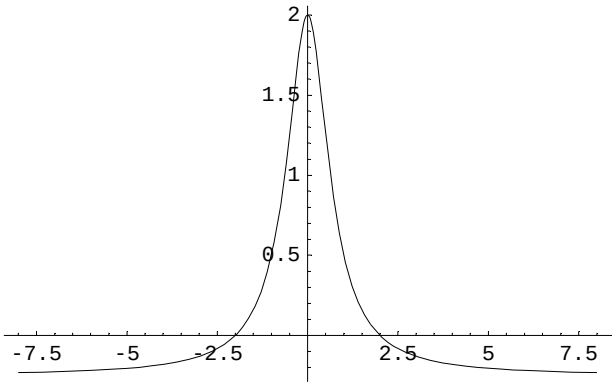
```
{0.5, -1., 1.66667, -2.66667, 0.888889,
 29.6296, -254.815, 1548.64, -7005.76, 9734.32, 290555.}
```

```
q1[x_]:=Evaluate[q[x]]
```

```
Plot[q1[x],{x,-2,2}];
```




```
Plot[q1[x],{x,-8,8}];
```



Potenzreihe, Abweichung

```
q2[x_]:=Normal[Series[q1[z],{z,0,10}]]/.z->x; q2[x]
```

$$2 - \frac{9\,x^2}{2} + 9\,x^4 - 18\,x^6 + 36\,x^8 - 72\,x^{10}$$

```
q2[x_]:=Evaluate[Normal[Series[q1[x],{x,0,10}]]]; q2[x]
```

$$2 - \frac{9\,x^2}{2} + 9\,x^4 - 18\,x^6 + 36\,x^8 - 72\,x^{10}$$

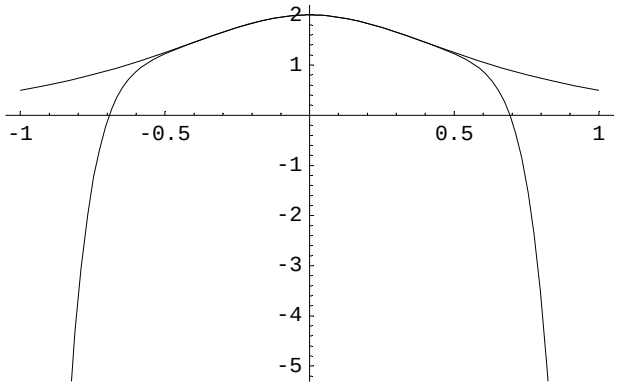
```
{q1[x],q2[x]}
```

$$\left\{\frac{1 - \frac{x^2}{4}}{\frac{1}{2} + x^2},\ 2 - \frac{9\,x^2}{2} + 9\,x^4 - 18\,x^6 + 36\,x^8 - 72\,x^{10}\right\}$$

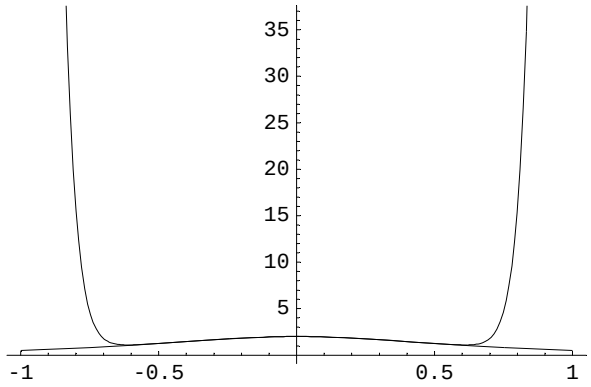
```
{q1[5],q2[5]}//N
```

$$\{-0.205882,\ -6.89338 \times 10^8\}$$

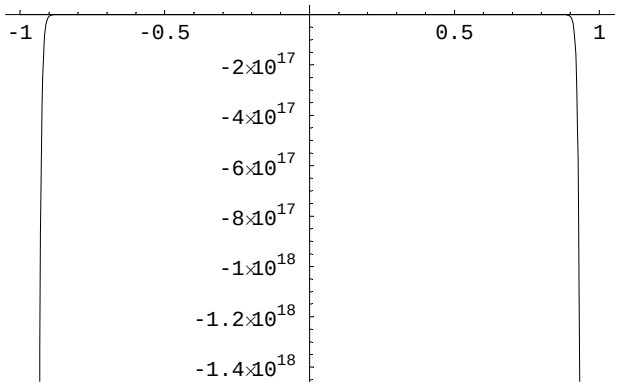
```
Plot[{q1[x],q2[x]},{x,-1,1}];
```




```
q2[x_]:=Evaluate[Normal[Series[q1[x],{x,0,20}]]]; Plot[{q1[x],q2[x]},{x,-1,1}];
```




```
q2[x_]:=Evaluate[Normal[Series[q1[x],{x,0,150}]]]; Plot[{q1[x],q2[x]},{x,-1,1}];
```




```
q2[x_]:=Evaluate[Normal[Series[q1[x],{x,0,10}]]]; d1=q2[x]/.x->0.5
```

```
1.22656
```

```
d2=q[x]/.x->0.5
```

```
1.25
```

```
d2-d1
```

```
0.0234375
```

```
q[x]-q2[x]/.x->0.9
```

```
15.5228
```

5 Reihe, Maximum Geometrie

a

```
Normal[Series[ArcTan[x],{x,0,10}]]
```

$$x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \frac{x^9}{9}$$

```
4(Normal[Series[ArcTan[x],{x,0,10}]]/.x->1)//N
```

```
3.33968
```

```
4(Normal[Series[ArcTan[x],{x,0,2000}]]/.x->1)//N
```

```
3.14059
```

b

10m : 2m

Breite 10 m

Höhe: x : 2 = (x+10) : h, l = f[x]

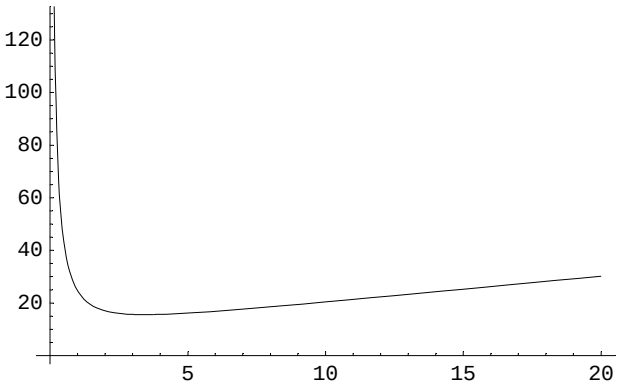
```
Solve[ x / 2 == (x+10) / h,{h}]
```

$$\left\{\left\{h \to \frac{2\,(10+x)}{x}\right\}\right\}$$

```
f[x_] := Sqrt[(2 (10 + x)/x)^2 + (x + 10)^2]; f[x]
```

$$\sqrt{(10+x)^2 + \frac{4\,(10+x)^2}{x^2}}$$

```
Plot[f[x],{x,0,20}];
```



f'[x]

$$\frac{2\,(10+x)+\frac{8\,(10+x)}{x^2}-\frac{8\,(10+x)^2}{x^3}}{2\sqrt{(10+x)^2+\frac{4\,(10+x)^2}{x^2}}}$$

Solve[Evaluate[f'[x]==0],{x}]

$$\{\{x\to -2\,(-5)^{1/3}\},\ \{x\to 2\,5^{1/3}\},\ \{x\to 2\,(-1)^{2/3}\,5^{1/3}\}\}$$

Solve[Evaluate[f'[x]==0],{x}]//N

$$\{\{x\to -1.70998-2.96177\,i\},\ \{x\to 3.41995\},\ \{x\to -1.70998+2.96177\,i\}\}$$

(-5)^1/3 // N

$$0.854988+1.48088\,i$$

(-1)^2/3 // N

$$-0.5+0.866025\,i$$

((-1)^2/3)^2 // N

$$-0.5-0.866025\,i$$

((-1)^2/3)^3 // N

1.

C

tan1=49/10

$$\frac{49}{10}$$

weite=2/tan1 -0.7

$$-0.291837$$