Lösungen

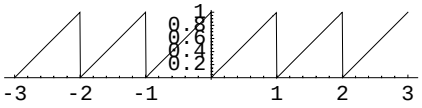
1

■ a

```
T=1;
```

■ b

```
f[t_]:=t-Floor[t];
Plot[f[t],{t,-3,3},AspectRatio->Automatic];
```



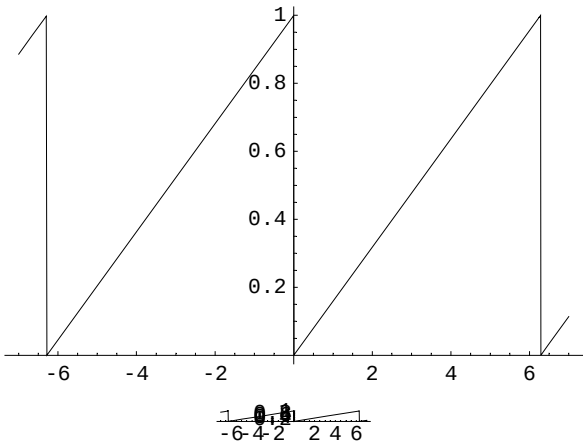
■ c t' = tt

```
tt=t 2 Pi;
f1[tt_]:=f[tt/(2 Pi)];
f1[tt]
```

```
t - Floor[t]
```

■ d

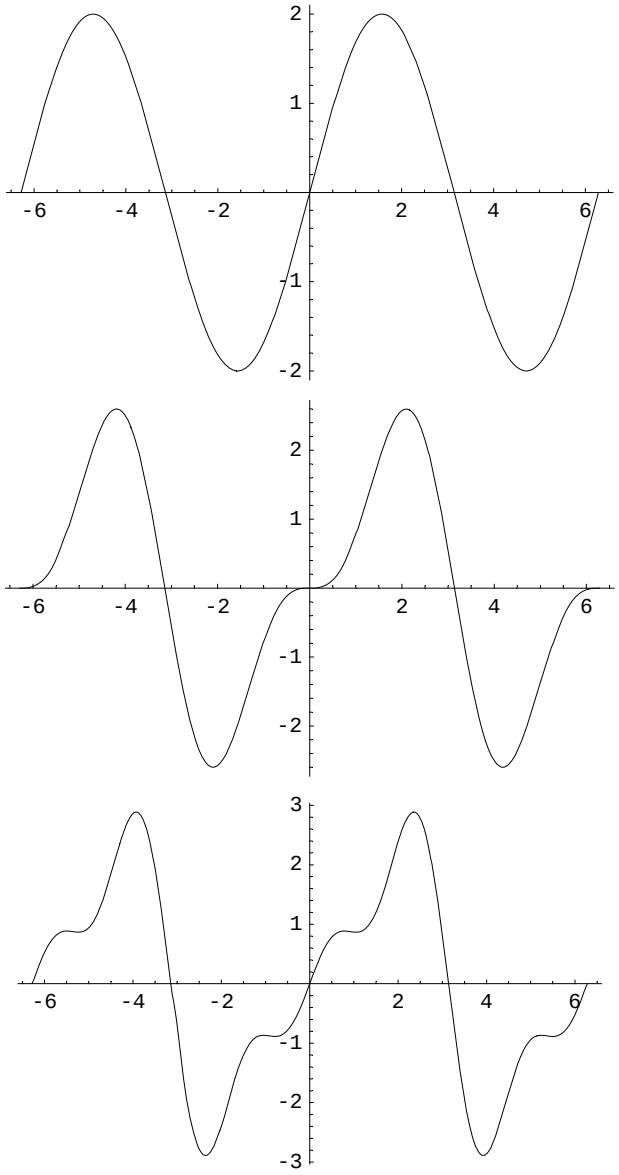
```
Plot[f1[tt],{tt,-7,7}];
Plot[f1[tt],{tt,-7,7},AspectRatio->Automatic];
```

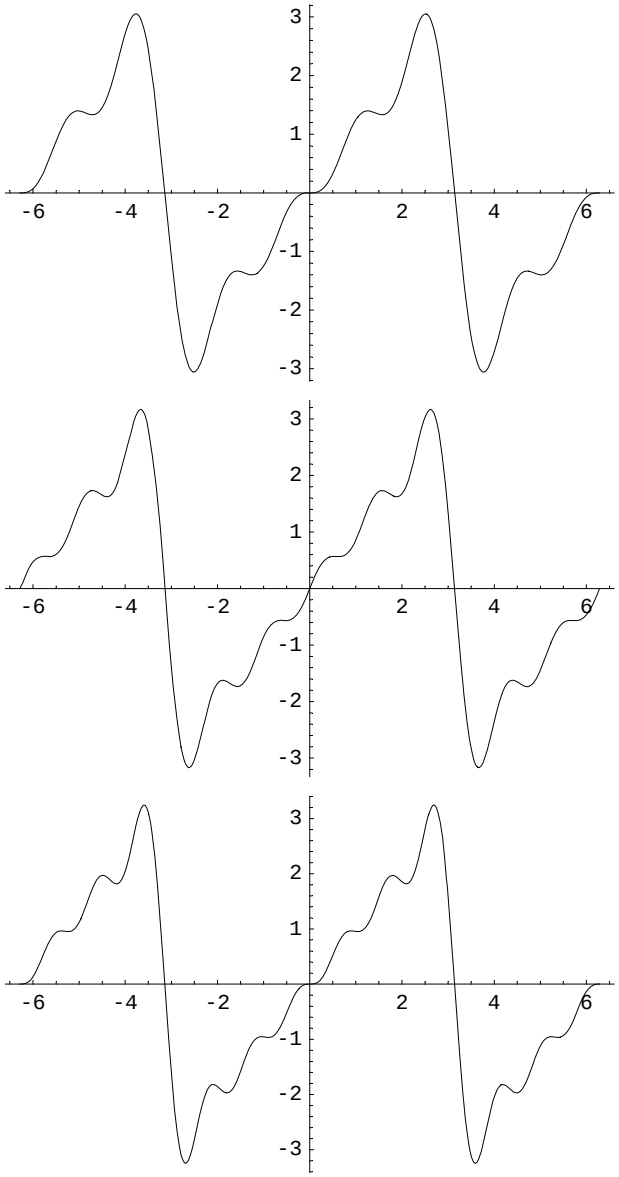


2

■ a

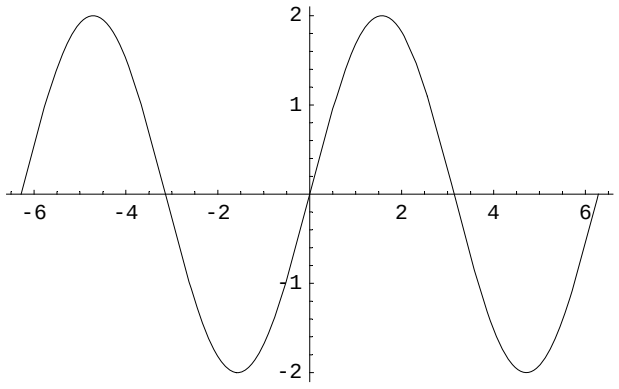
```
s[n_,t_]:= 2 Sum[(-1)^(k+1) /k Sin[k t],{k,1,n}];
Table[Plot[s[n,t],{t,-2Pi,2Pi}],{n,1,6}];
```

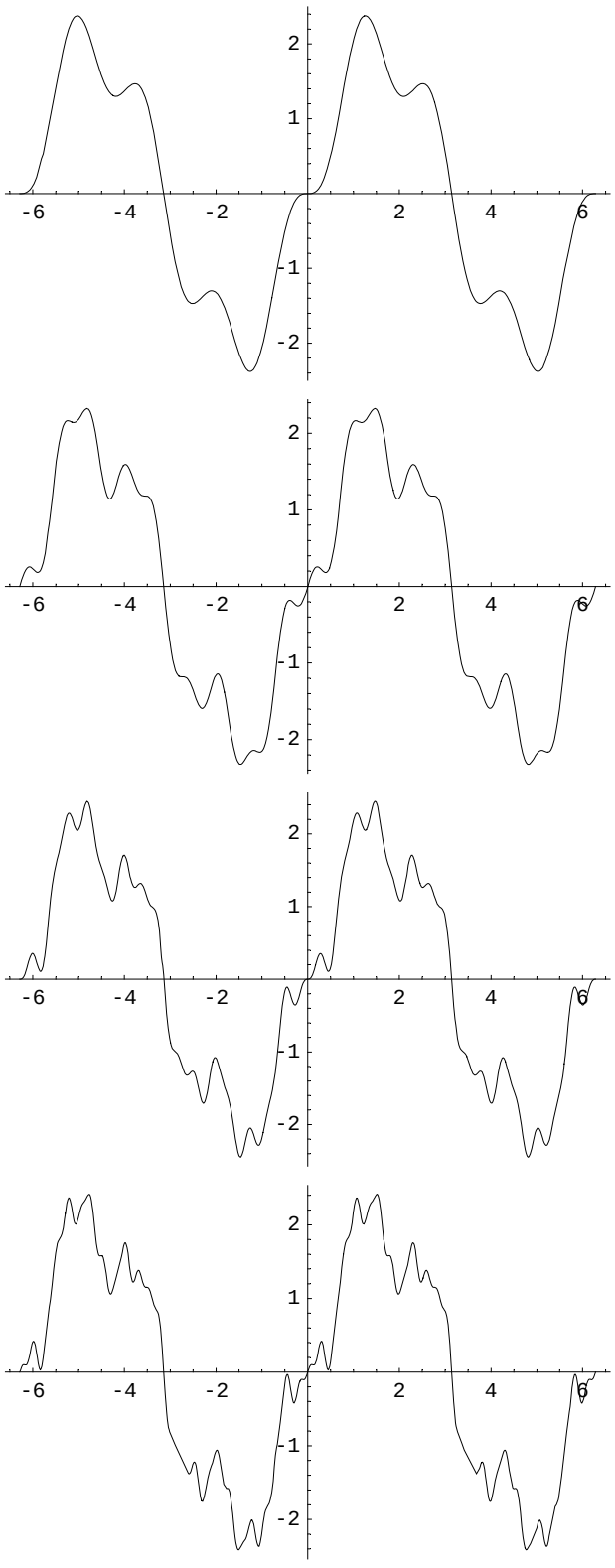


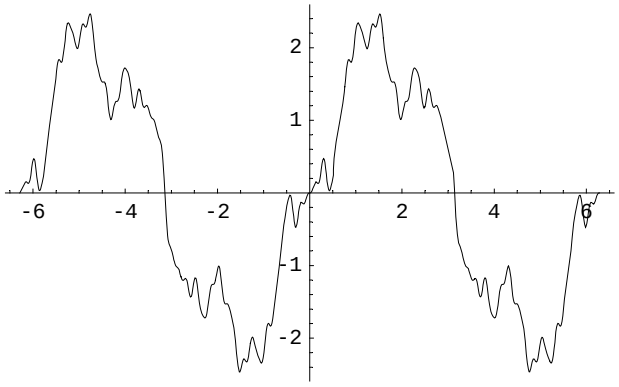


■ b1

```
s[n_,t_]:= 2 Sum[(-1)^(k^2+1) /k^2 Sin[k^2 t],{k,1,n}];
Table[Plot[s[n,t],{t,-2Pi,2Pi}],{n,1,6}];
```

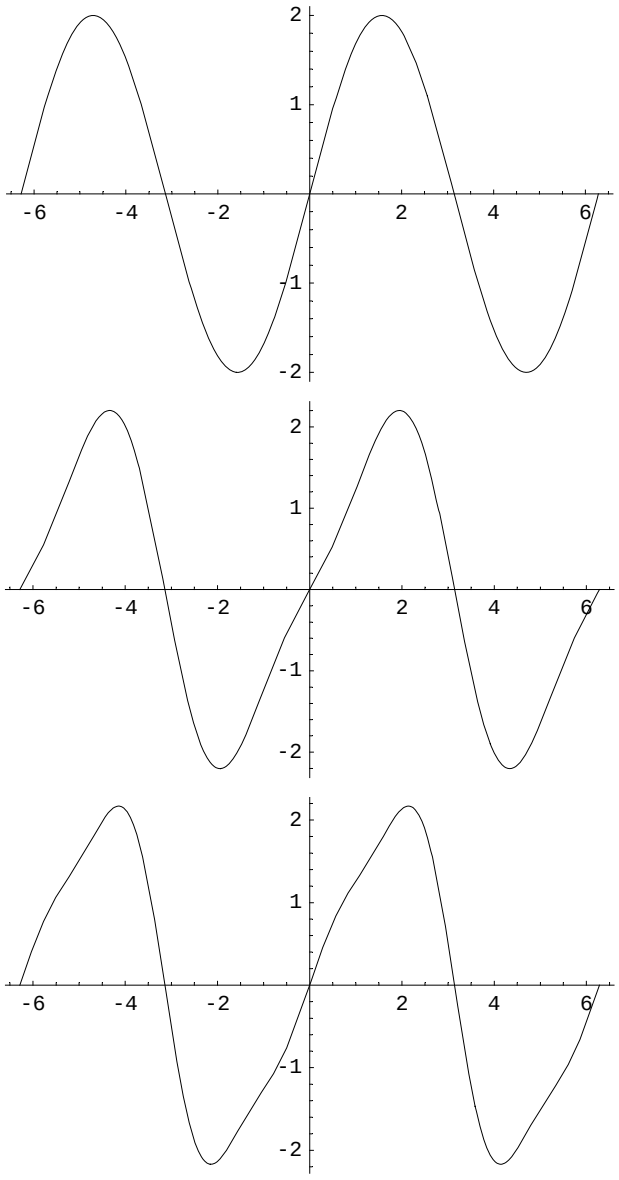


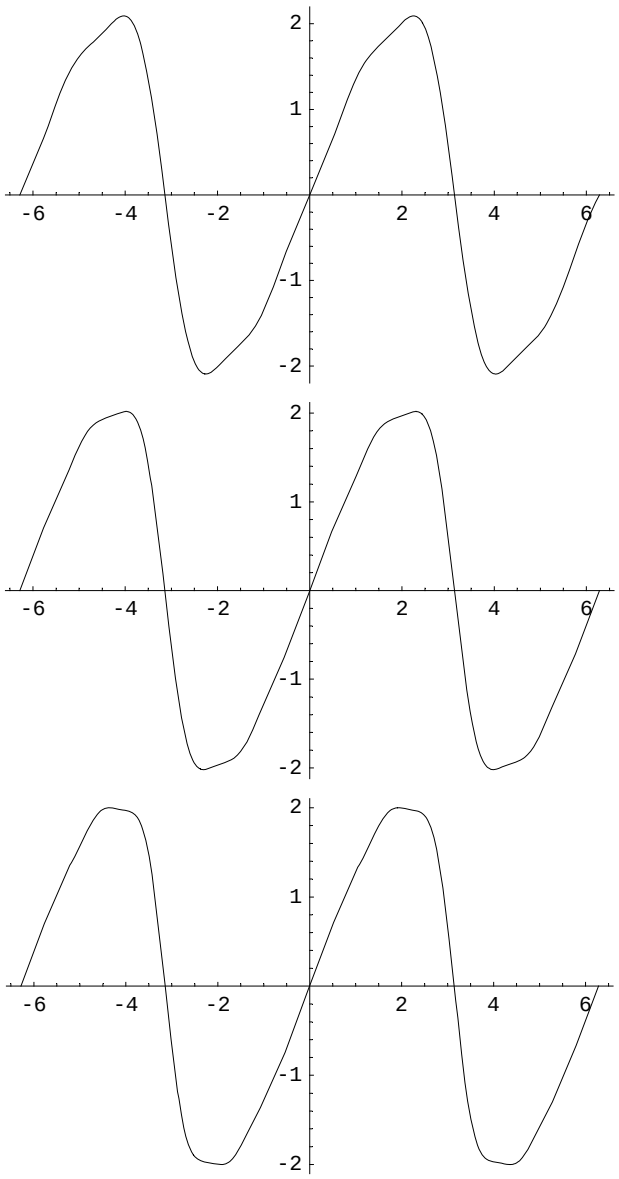

2
1
-6
-4
-2
2
4
6
-1
-2



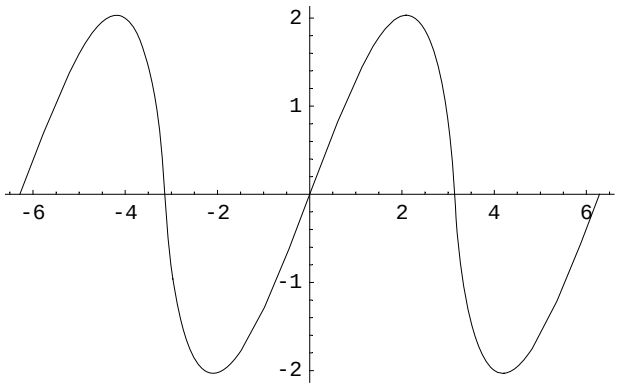
■ b2

```
s[n_,t_]:= 2 Sum[(-1)^(k+1) /k^2 Sin[k t],{k,1,n}];
Table[Plot[s[n,t],{t,-2Pi,2Pi}],{n,1,6}];
```



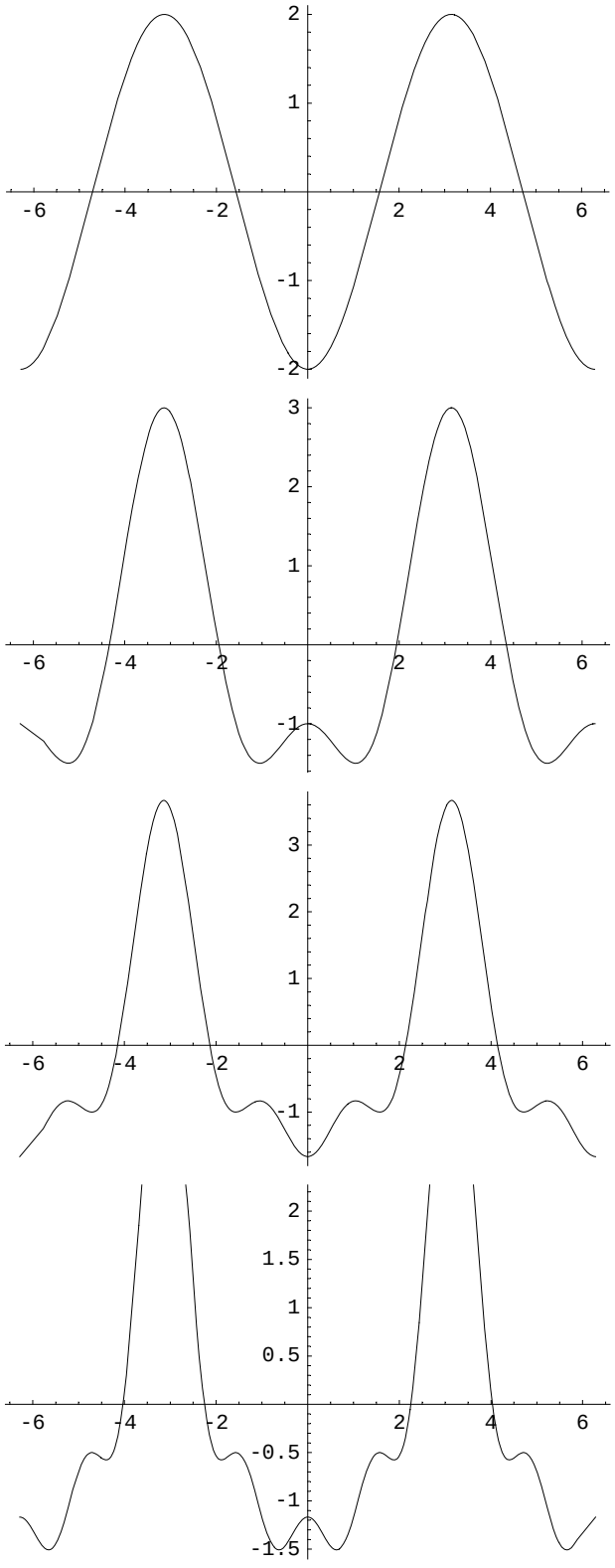


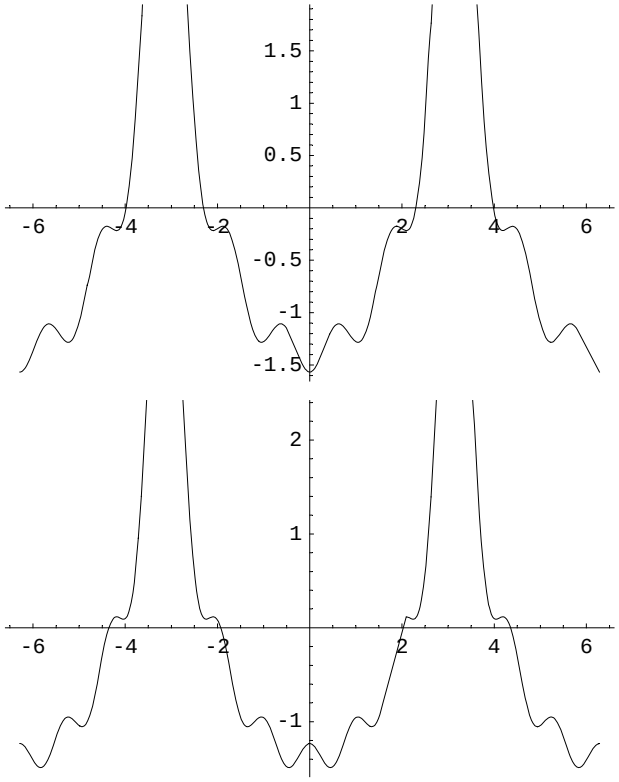

```
Plot[s[50,t],{t,-2Pi,2Pi}];
```



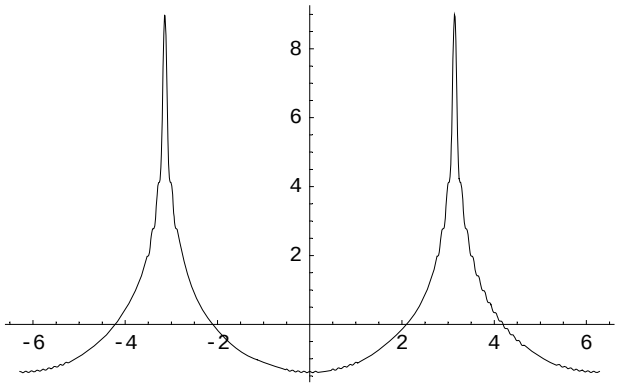
■ C

```
s[n_,t_]:= 2 Sum[(-1)^k /k Cos[k t],{k,1,n}];
Table[Plot[s[n,t],{t,-2Pi,2Pi}],{n,1,6}];
```


2
1
-6
-4
-2
2
4
6
-1
-2
3
2
1
-6
-4
-2
2
4
6
-1
3
2
1
-6
-4
-2
2
4
6
-1
2
1.5
1
0.5
-6
-4
-2
2
4
6
-0.5
-1
-1.5

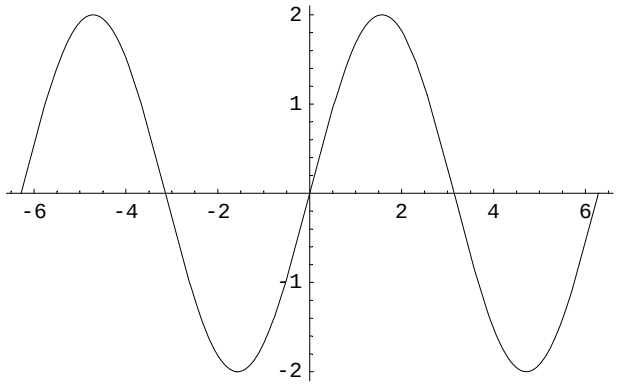



```
Plot[s[50,t],{t,-2Pi,2Pi}];
```



■ d1

```
s[n_,t_]:= 2 Sum[(-1)^(k^(1/2)+1) /(k^(1/2)) Sin[k^(1/2) t],{k,1,n}];
Table[Plot[s[n,t],{t,-2Pi,2Pi}],{n,1,2}];
```

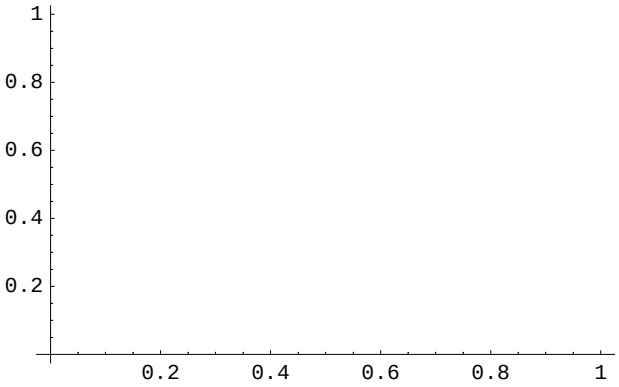


Plot::plnr : s[n, t] is not a machine-size real number at t = -6.28318. Mehr…

Plot::plnr : s[n, t] is not a machine-size real number at t = -5.77341. Mehr…

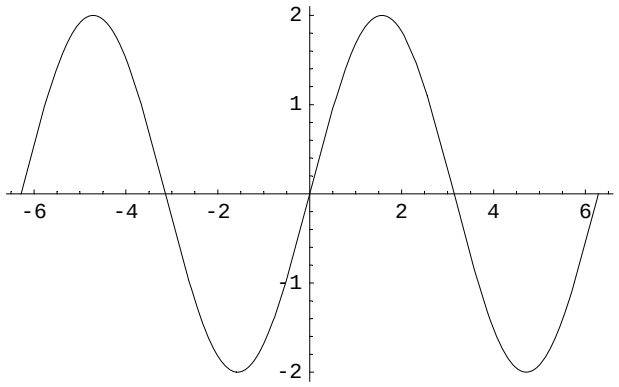
Plot::plnr : s[n, t] is not a machine-size real number at t = -5.21745. Mehr…

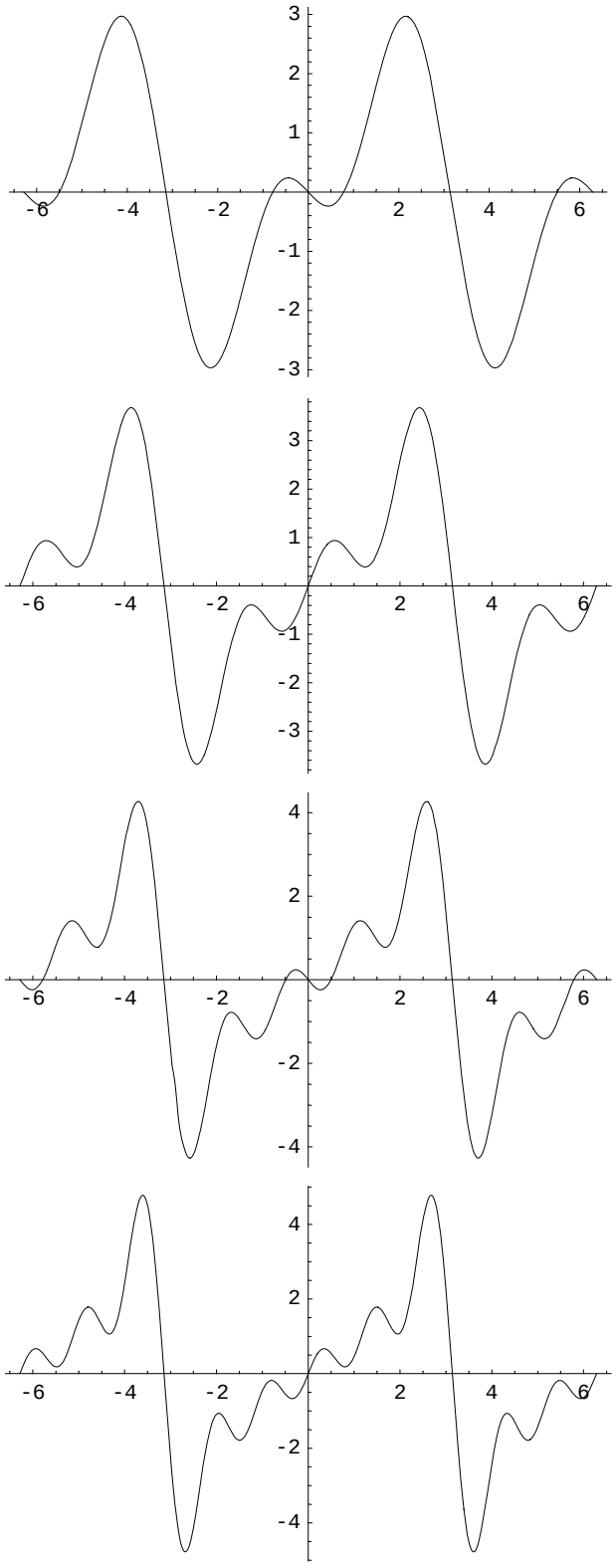
General::stop : Further output of Plot::plnr will be suppressed during this calculation. Mehr…



■ d2

```
s[n_,t_]:= 2 Sum[(-1)^(k+1) /(k^(1/2)) Sin[k t],{k,1,n}];
Table[Plot[s[n,t],{t,-2Pi,2Pi}],{n,1,6}];
```




3
2
1
-6
-4
-2
2
4
6
-1
-2
-3
3
2
1
-6
-4
-2
2
4
6
-1
-2
-3
4
2
-6
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6
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-4
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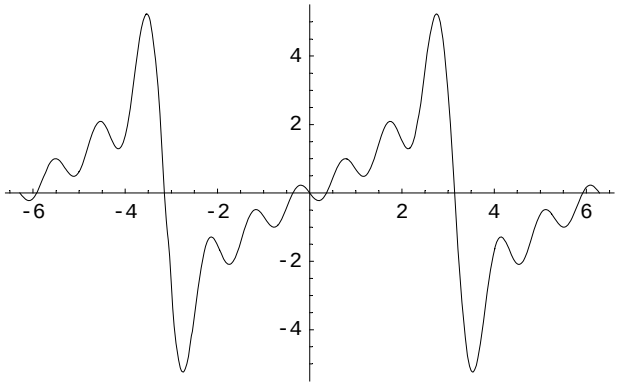
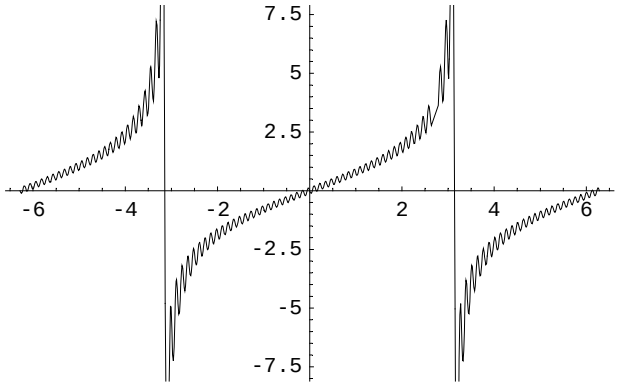
2
-6
-4
-2
2
4
6
-2
-4



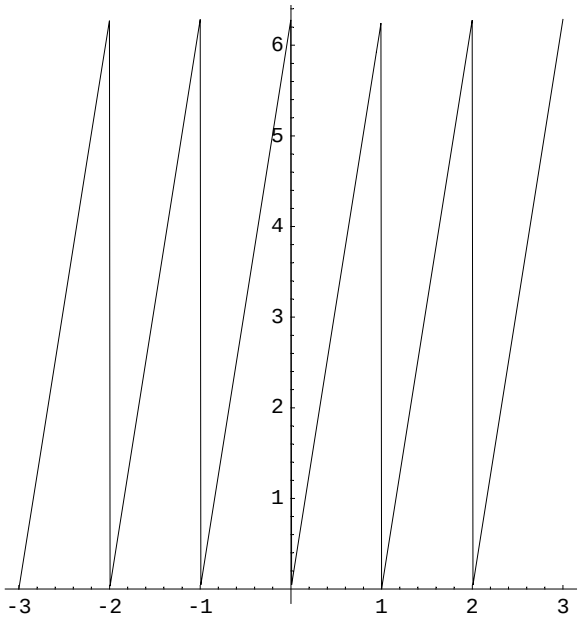

```
Plot[s[50,t],{t,-2Pi,2Pi}];
```



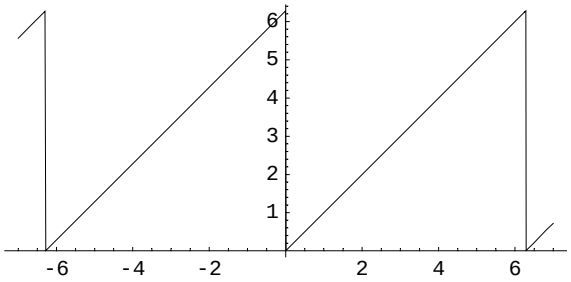
3

■ a

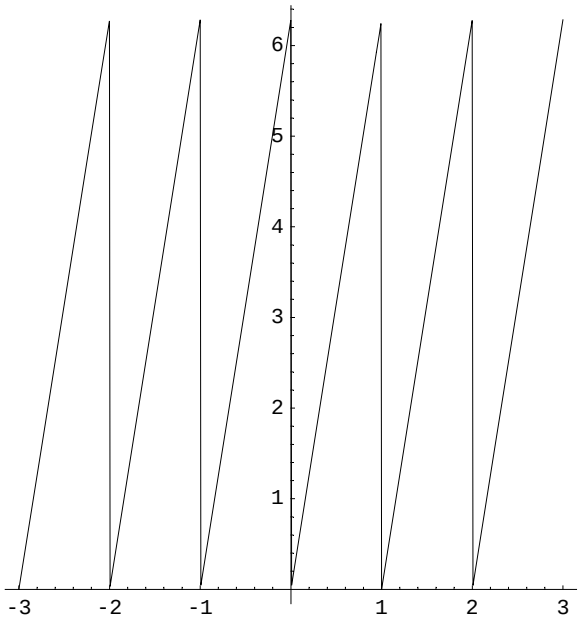
```
f[t_]:=2Pi(t-Floor[t]);
Plot[f[t],{t,-3,3},AspectRatio->Automatic];
```



```
tt=t 2 Pi;
f1[tt_]:=f[tt/(2 Pi)];
Plot[f1[tt],{tt,-7,7},AspectRatio->Automatic];
```




```
ttt=tt/(2Pi);
f2[ttt_]:=f1[ttt 2 Pi];
Plot[f2[ttt],{ttt,-3,3},AspectRatio->Automatic];
```




```
Remove["Global`*"]

<<Calculus`FourierTransform`

?*FourierTrig*
```

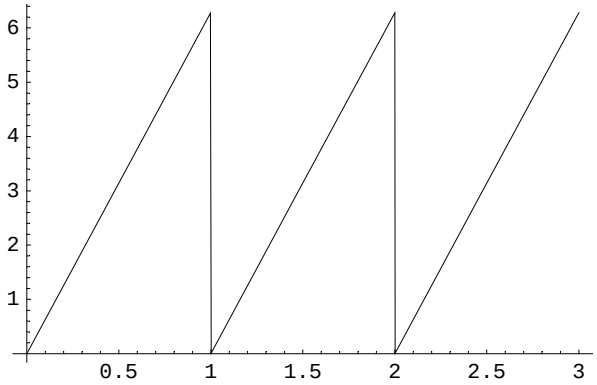
Calculus`FourierTransform`

FourierTrigSeries NFourierTrigSeries

```
?FourierTrigSeries
```

FourierTrigSeries[expr, t, k] gives the kth order Fourier trigonometric series approximation to the periodic function of t that is equal to expr for -1/2 <= t <= 1/2, and has a period of 1. FourierTrigSeries[expr, t, k, FourierParameters -> {a, b}] gives the kth order Fourier trigonometric series approximation to the periodic function of t that is equal to expr for -1/(2 Abs[b]) <= t <= 1/(2 Abs[b]), and has a period of 1/Abs[b]. Mehr...

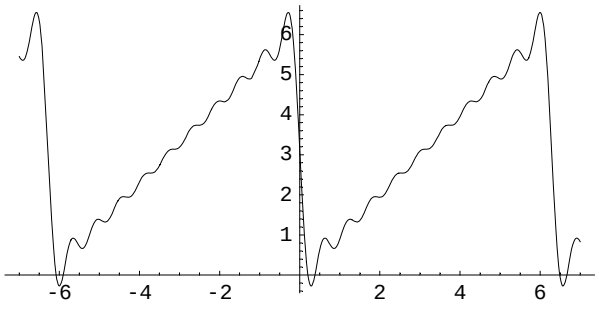
```
f[t_]:=2Pi(t-Floor[t]);
Plot[f[t],{t,0,3}];
```




```
FourierTrigSeries[f[t], t, 10]
```

$$\pi - 2\,\text{Sin}[2\pi t] - \text{Sin}[4\pi t] - \frac{2}{3}\,\text{Sin}[6\pi t] - \frac{1}{2}\,\text{Sin}[8\pi t] - \frac{2}{5}\,\text{Sin}[10\pi t] - \frac{1}{3}\,\text{Sin}[12\pi t] - \frac{2}{7}\,\text{Sin}[14\pi t] - \frac{1}{4}\,\text{Sin}[16\pi t] - \frac{2}{9}\,\text{Sin}[18\pi t] - \frac{1}{5}\,\text{Sin}[20\pi t]$$

```
f1g10[tt_]:=FourierTrigSeries[f[t], t, 10]/.t->tt/(2 Pi);
Plot[Evaluate[f1g10[tt]],{tt,-7,7},AspectRatio->Automatic];
```



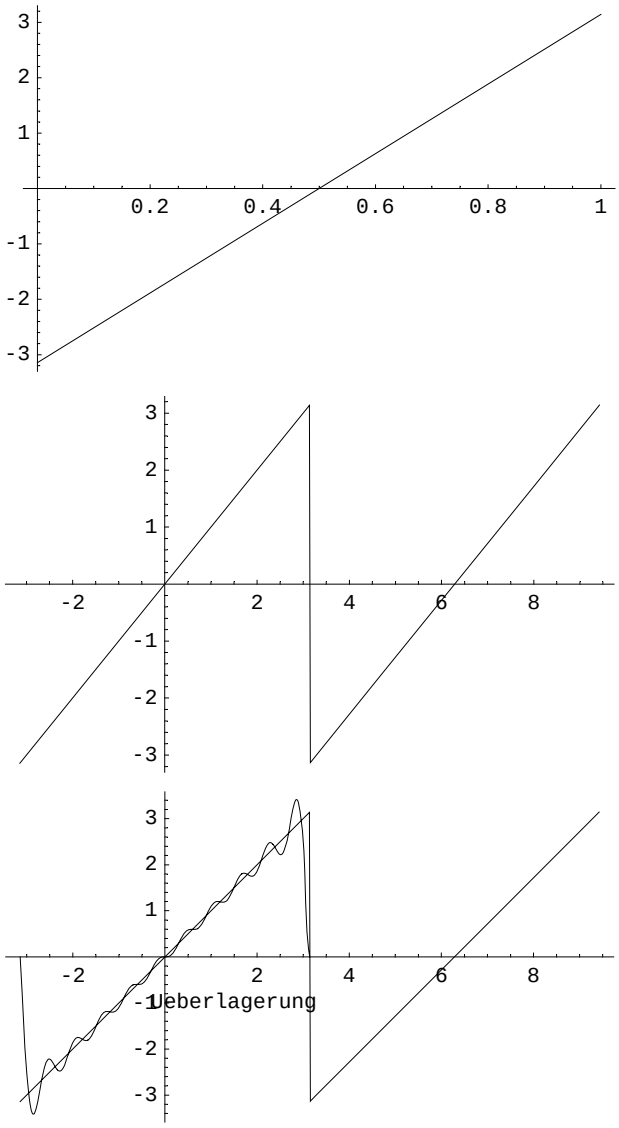
■ b

```
?FourierTrigSeries
```

FourierTrigSeries[expr, t, k] gives the kth order Fourier trigonometric series approximation to the periodic function of t that is equal to expr for -1/2 <= t <= 1/2, and has a period of 1. FourierTrigSeries[expr, t, k, FourierParameters -> {a, b}] gives the kth order Fourier trigonometric series approximation to the periodic function of t that is equal to expr for -1/(2 Abs[b]) <= t <= 1/(2 Abs[b]), and has a period of 1/Abs[b]. Mehr...

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

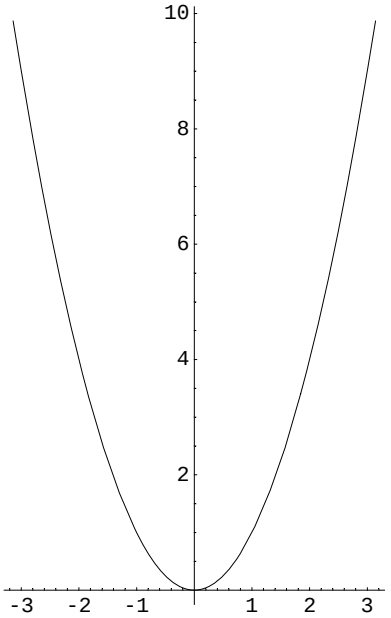
```
<<Calculus`FourierTransform`;
f[t_]:=2Pi(t-Floor[t])-Pi;
f1[t_]:=f[t/(2Pi)-1/2];
p1=Plot[f[t],{t,0,1}];
p2=Plot[f1[t],{t,-Pi,3Pi}];
p3=Plot[f1[t],{t,-Pi,3Pi},AspectRatio->Automatic,DisplayFunction->Identity,PlotStyl
e→{Text["Ueberlagerung",{1.5,-1},{0,0}]}];
f1g10[tt_]:=FourierTrigSeries[f[t], t, 10]/.t->tt/(2 Pi)-1/2;
p4=Plot[Evaluate[f1g10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Ide
ntity];
Show[p3,p4,DisplayFunction->$DisplayFunction];
FourierTrigSeries[f[t], t, 10];
```

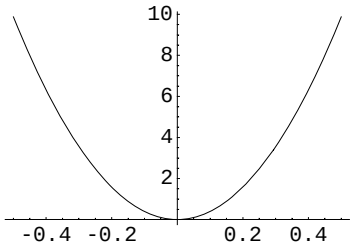


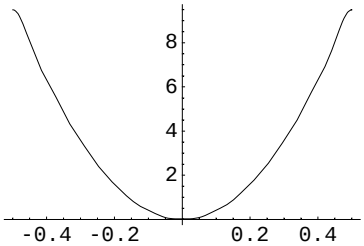
■ C

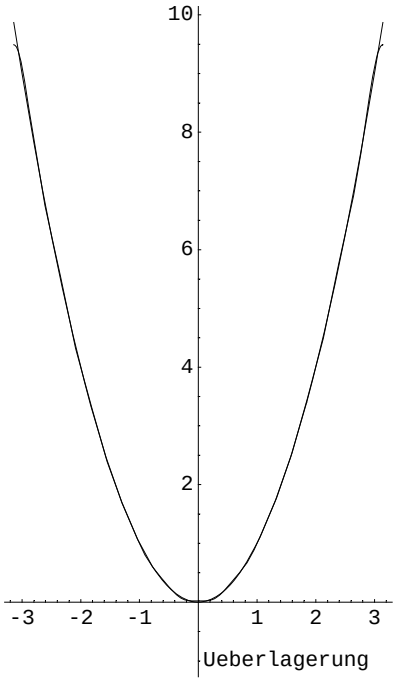
```
Remove["Global`*"]
```

```
<<Calculus`FourierTransform`;
f[t_]:=t^2;
f1[t_]:=f[t 2 Pi];
p1=Plot[f[t],{t,-Pi,Pi},AspectRatio->Automatic];
p2=Plot[f1[t],{t,-0.5,0.5}];
Plot[Evaluate[FourierTrigSeries[f1[t], t, 10]],{t,-0.5,0.5}];
f1g10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);
p3=Plot[Evaluate[f1g10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Ide
ntity,PlotStyle→{Text["Ueberlagerung",{1.5,-1},{0,0}]}];
Show[p1,p3,DisplayFunction->$DisplayFunction];
FourierTrigSeries[f1[t], t, 10];
```





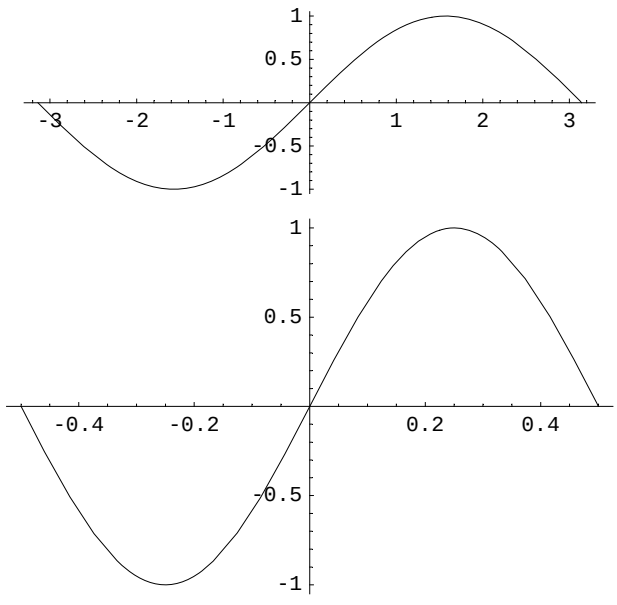


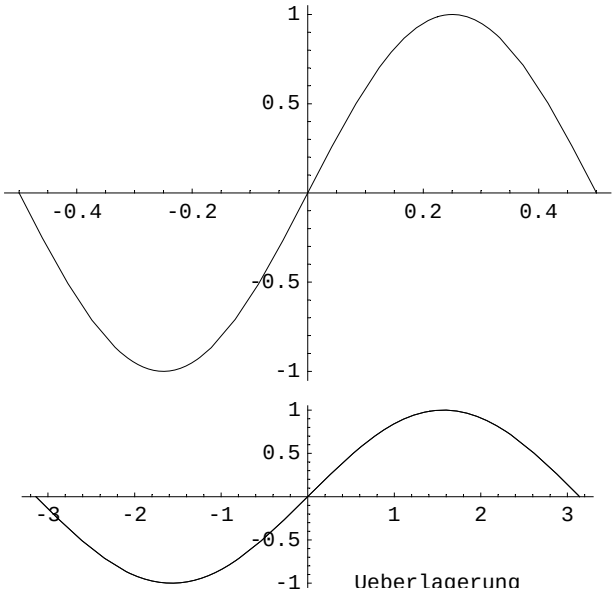


■ d

```
Remove["Global`*"]

<<Calculus`FourierTransform`;
f[t_]:=Sin[t];
f1[t_]:=f[t 2 Pi];
p1=Plot[f[t],{t,-Pi,Pi},AspectRatio->Automatic];
p2=Plot[f1[t],{t,-0.5,0.5}];
Plot[Evaluate[FourierTrigSeries[f1[t], t, 10]],{t,-0.5,0.5}];
f1g10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);
p3=Plot[Evaluate[f1g10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Ide
ntity,PlotStyle→{Text["Ueberlagerung",{1.5,-1},{0,0}]}];
Show[p1,p3,DisplayFunction->$DisplayFunction];
FourierTrigSeries[f1[t], t, 10];
```

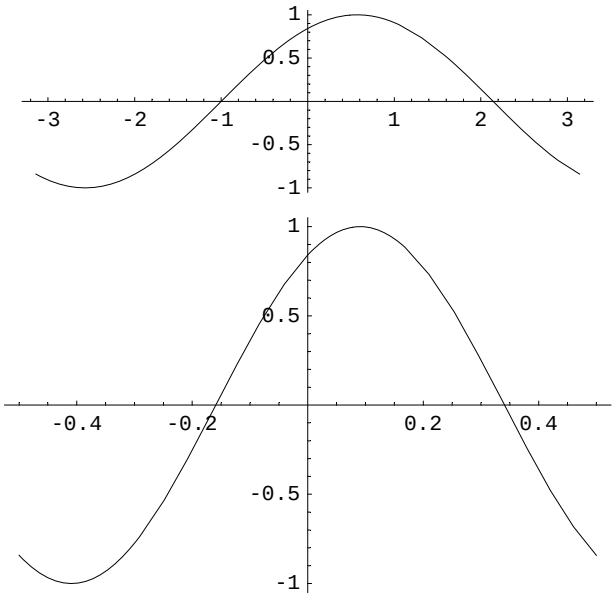


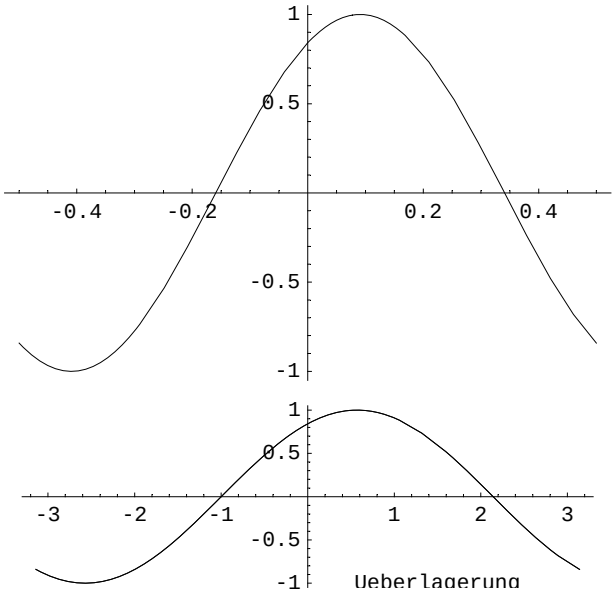


■ e

```
Remove["Global`*"]

<<Calculus`FourierTransform`;
f[t_]:=Sin[t+1];
f1[t_]:=f[t 2 Pi];
p1=Plot[f[t],{t,-Pi,Pi},AspectRatio->Automatic];
p2=Plot[f1[t],{t,-0.5,0.5}];
Plot[Evaluate[FourierTrigSeries[f1[t], t, 10]],{t,-0.5,0.5}];
f1g10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);
p3=Plot[Evaluate[f1g10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Ide
ntity,PlotStyle→{Text["Ueberlagerung",{1.5,-1},{0,0}]}];
Show[p1,p3,DisplayFunction->$DisplayFunction];
FourierTrigSeries[f1[t], t, 10];
```

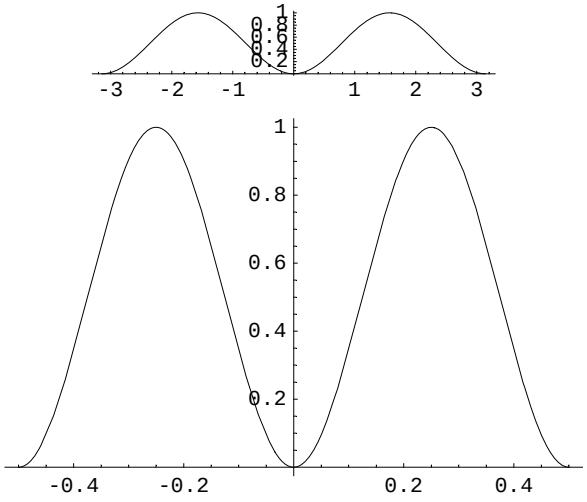


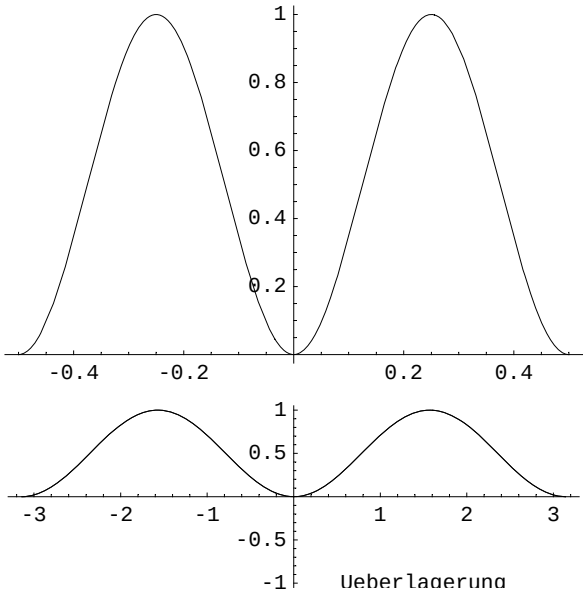


■ f

```
Remove["Global`*"]

<<Calculus`FourierTransform`;
f[t_]:=Sin[t]^2;
f1[t_]:=f[t 2 Pi];
p1=Plot[f[t],{t,-Pi,Pi},AspectRatio->Automatic];
p2=Plot[f1[t],{t,-0.5,0.5}];
Plot[Evaluate[FourierTrigSeries[f1[t], t, 10]],{t,-0.5,0.5}];
f1g10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);
p3=Plot[Evaluate[f1g10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Ide
ntity,PlotStyle→{Text["Ueberlagerung",{1.5,-1},{0,0}]}];
Show[p1,p3,DisplayFunction->$DisplayFunction];
FourierTrigSeries[f1[t], t, 10];
```

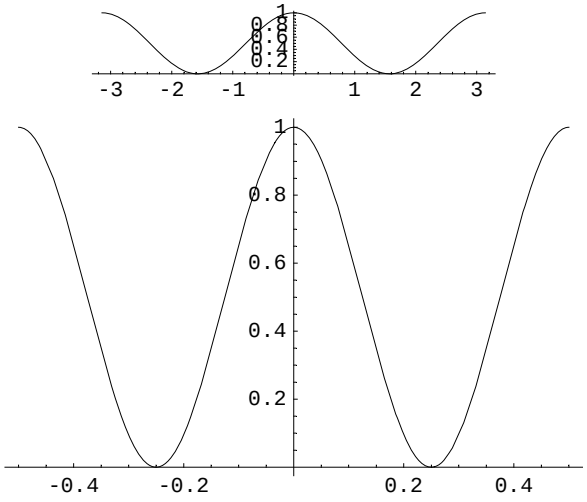


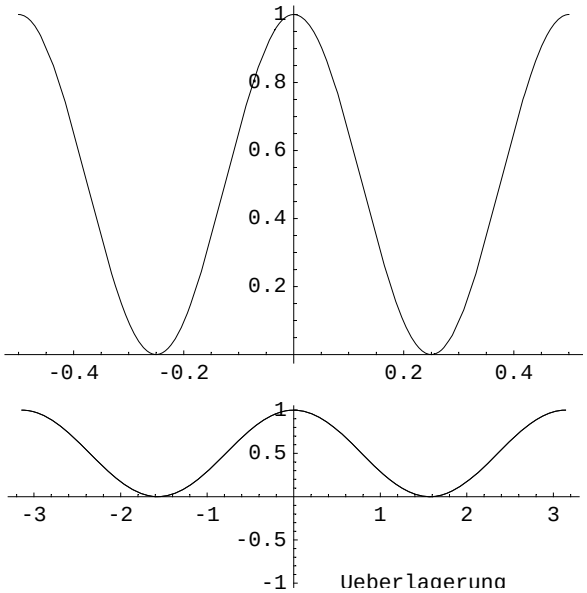


■ g

```
Remove["Global`*"]

<<Calculus`FourierTransform`;
f[t_]:=Cos[t]^2;
f1[t_]:=f[t 2 Pi];
p1=Plot[f[t],{t,-Pi,Pi},AspectRatio->Automatic];
p2=Plot[f1[t],{t,-0.5,0.5}];
Plot[Evaluate[FourierTrigSeries[f1[t], t, 10]],{t,-0.5,0.5}];
f1g10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);
p3=Plot[Evaluate[f1g10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Ide
ntity,PlotStyle→{Text["Ueberlagerung",{1.5,-1},{0,0}]}];
Show[p1,p3,DisplayFunction->$DisplayFunction];
FourierTrigSeries[f1[t], t, 10];
```

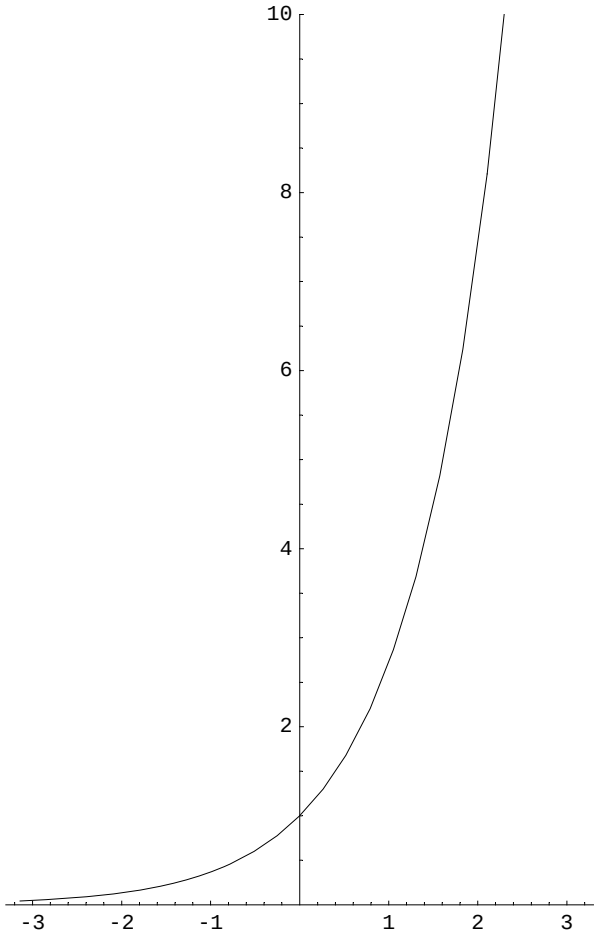


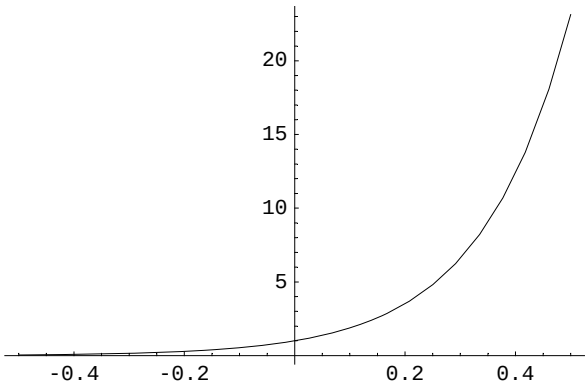


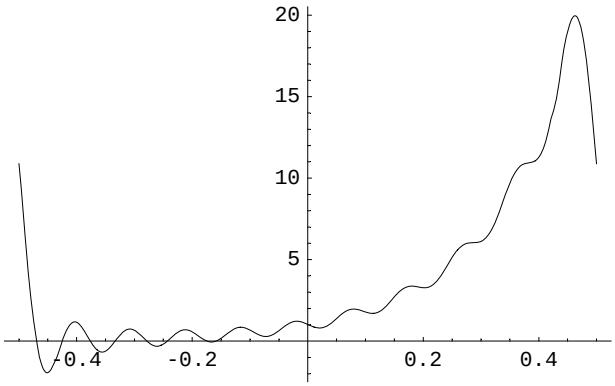
■ h

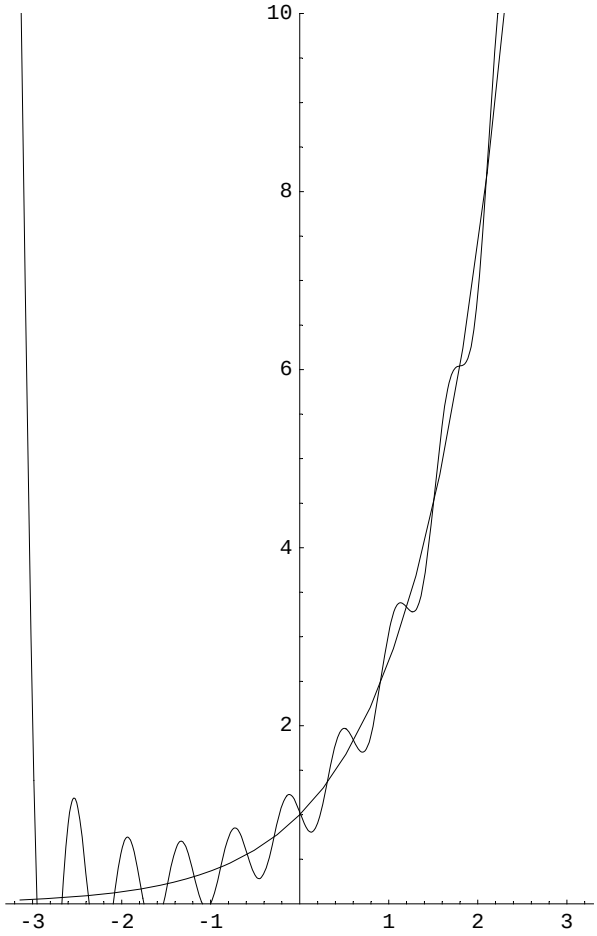
```
Remove["Global`*"]

<<Calculus`FourierTransform`;
f[t_]:=E^t;
f1[t_]:=f[t 2 Pi];
p1=Plot[f[t],{t,-Pi,Pi},AspectRatio->Automatic,PlotRange->{0,10}];
p2=Plot[f1[t],{t,-0.5,0.5}];
Plot[Evaluate[FourierTrigSeries[f1[t], t, 10]],{t,-0.5,0.5}];
f1g10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);
p3=Plot[Evaluate[f1g10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Ide
ntity,PlotStyle→{Text["Ueberlagerung",{1.5,-1},{0,0}]},PlotRange->{0,10}];
Show[p1,p3,DisplayFunction->$DisplayFunction];
FourierTrigSeries[f1[t], t, 10];
```


10
8
6
4
2
-3
-2
-1
1
2
3


20
15
10
5
-0.4
-0.2
0.2
0.4

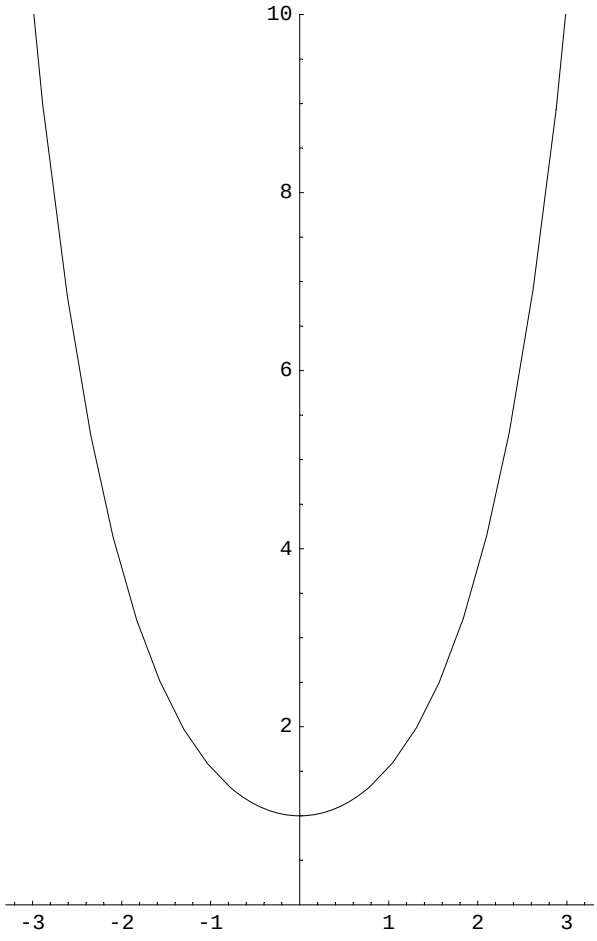

20
15
10
5
-0.4
-0.2
0.2
0.4



■ **i**

```
Remove["Global`*"]

<<Calculus`FourierTransform`;
f[t_]:=Cosh[t];
f1[t_]:=f[t 2 Pi];
p1=Plot[f[t],{t,-Pi,Pi},AspectRatio->Automatic,PlotRange->{0,10}];
p2=Plot[f1[t],{t,-0.5,0.5}];
Plot[Evaluate[FourierTrigSeries[f1[t], t, 10]],{t,-0.5,0.5}];
f1g10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);
p3=Plot[Evaluate[f1g10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Ide
ntity,PlotStyle→{Text["Ueberlagerung",{1.5,-1},{0,0}]},PlotRange->{0,10}];
Show[p1,p3,DisplayFunction->$DisplayFunction];
FourierTrigSeries[f1[t], t, 10];
```


10
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-3
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-1
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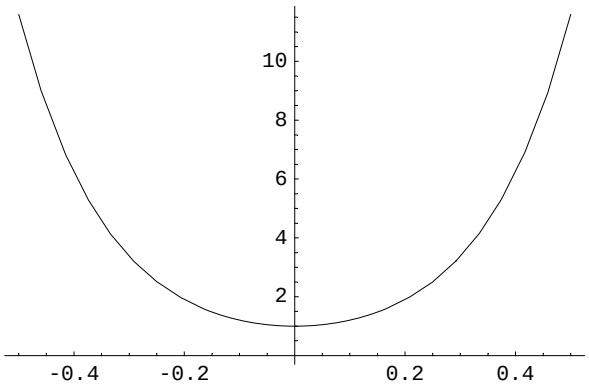
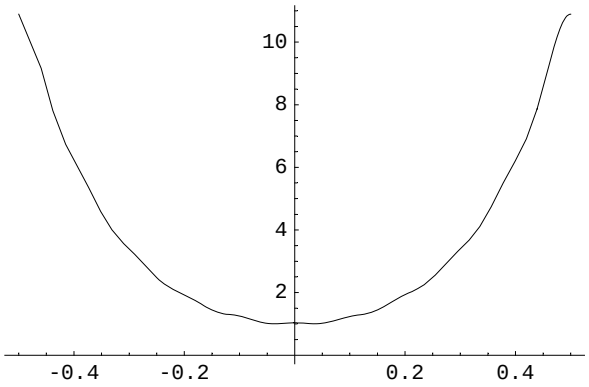
3


10
8
6
4
2
-0.4
-0.2
0.2
0.4


10
8
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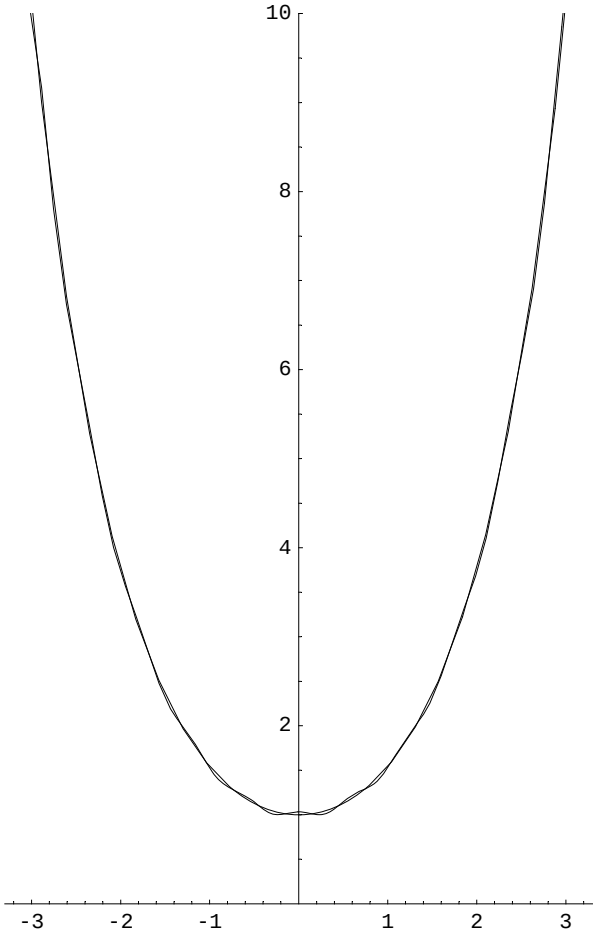
4
2
-0.4
-0.2
0.2
0.4


10
8
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4
2
-3
-2
-1
1
2
3