

Lösungen

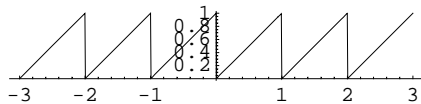
1

■ a

```
T=1;
```

■ b

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

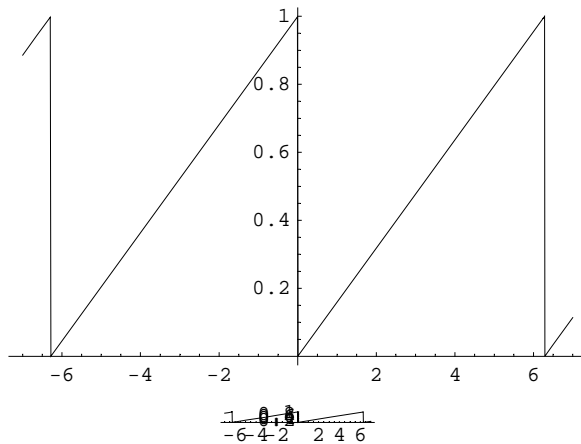


■ c $t' = tt$

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

■ d

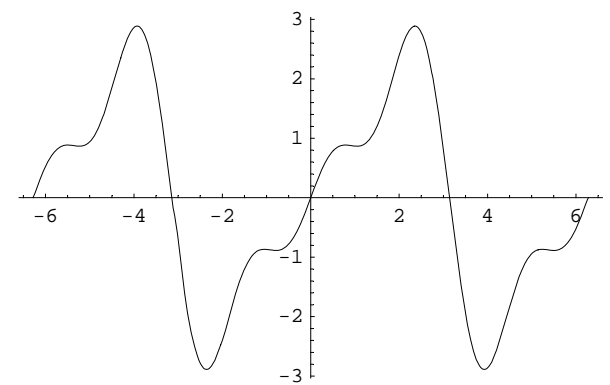
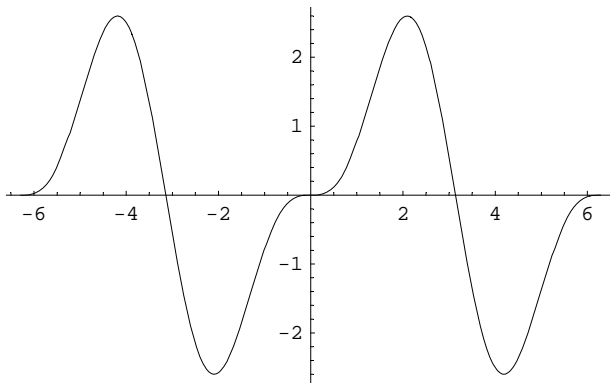
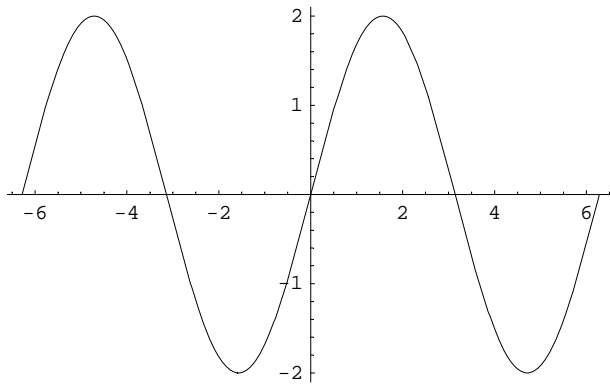
```
Plot[f1[tt],{tt,-7,7}];
Plot[f1[tt],{tt,-7,7},AspectRatio->Automatic];
```

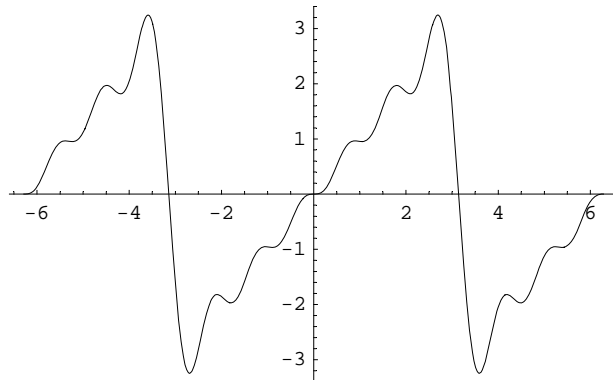
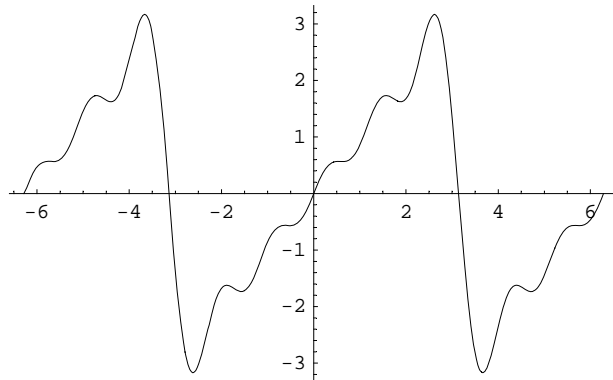
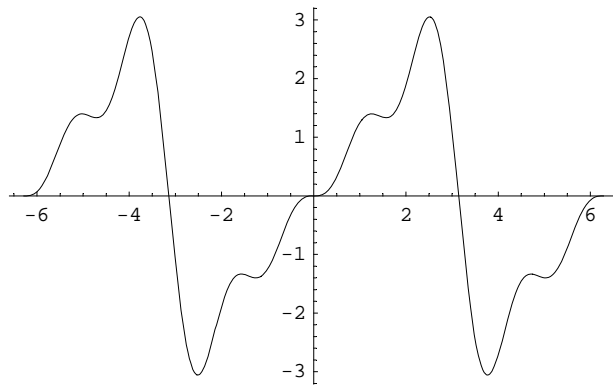


2

■ a

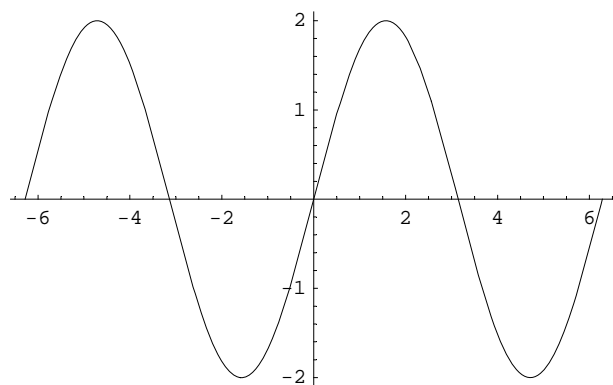
```
s[n_,t_]:= 2 Sum[(-1)^(k+1) /k Sin[k t],{k,1,n}];  
Table[Plot[s[n,t],{t,-2Pi,2Pi}],{n,1,6}];
```

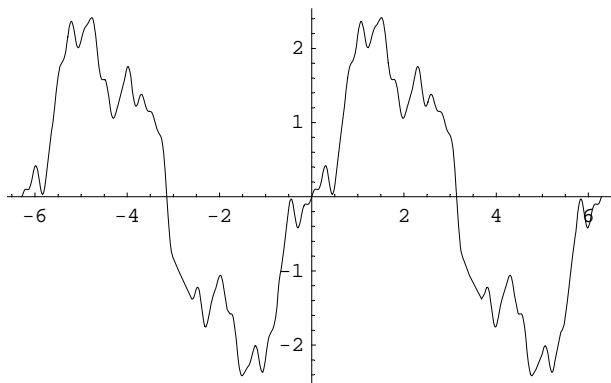
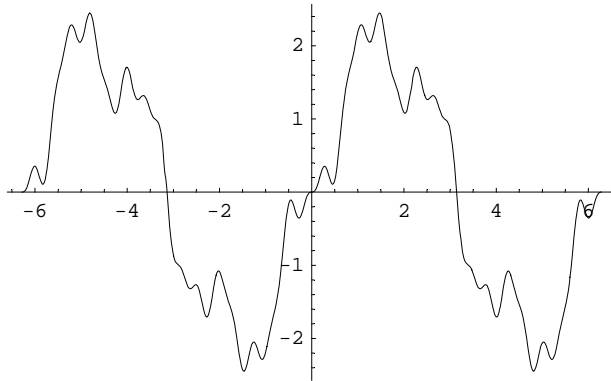
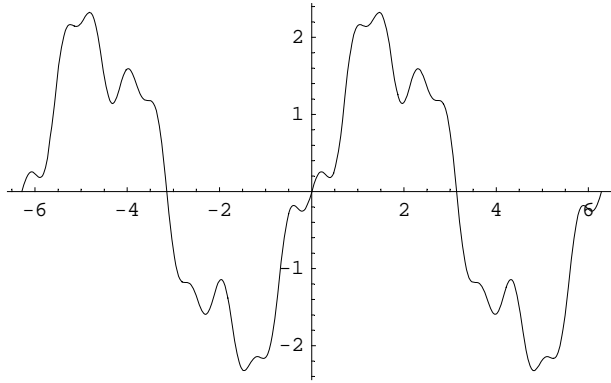
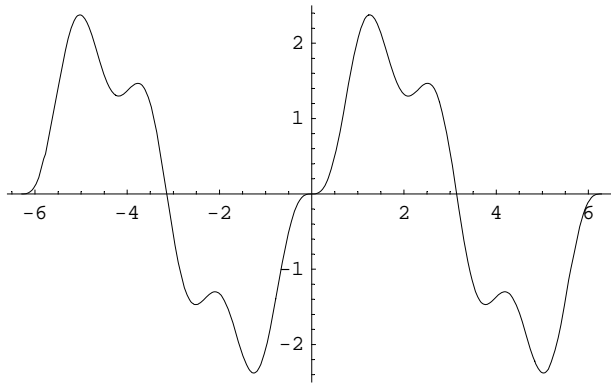


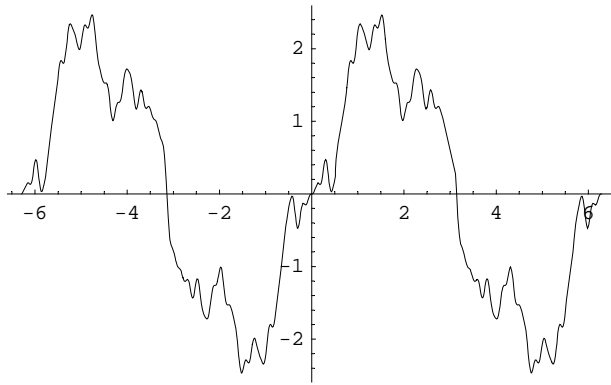


■ b1

```
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}];
```

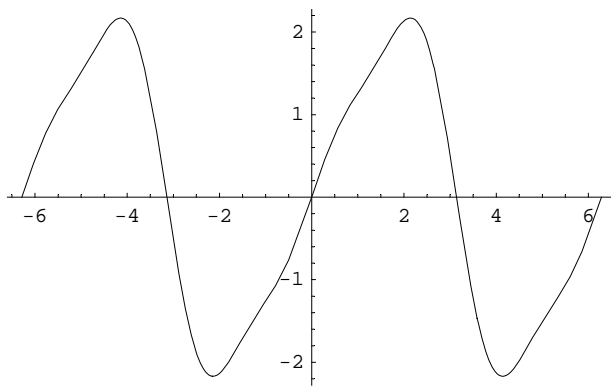
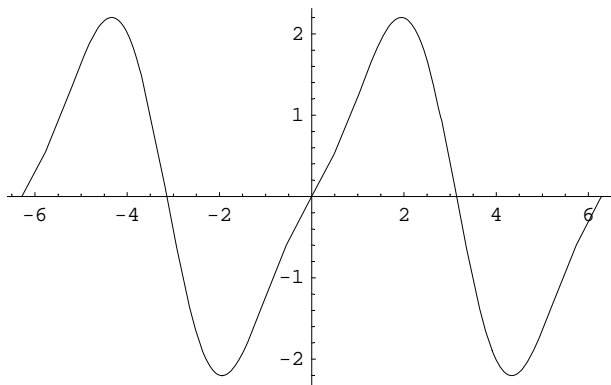
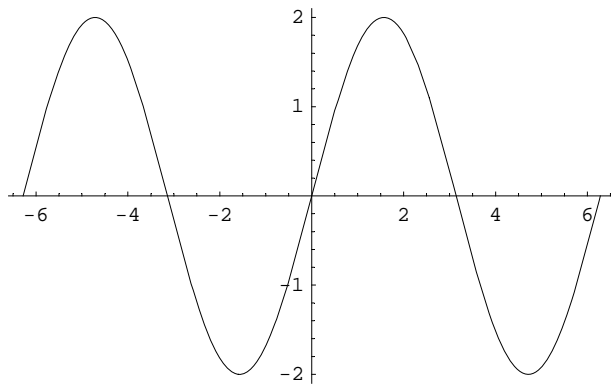


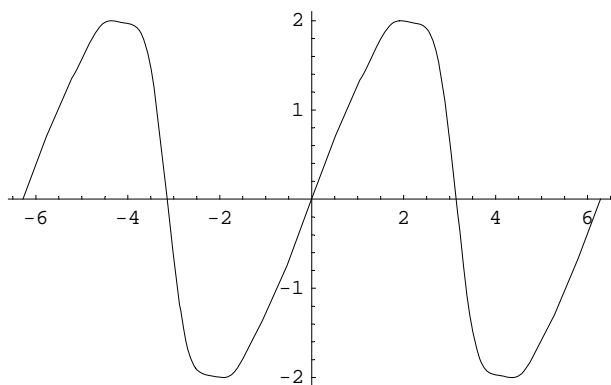
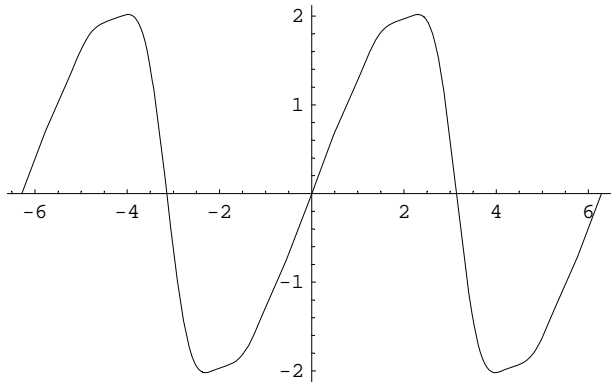
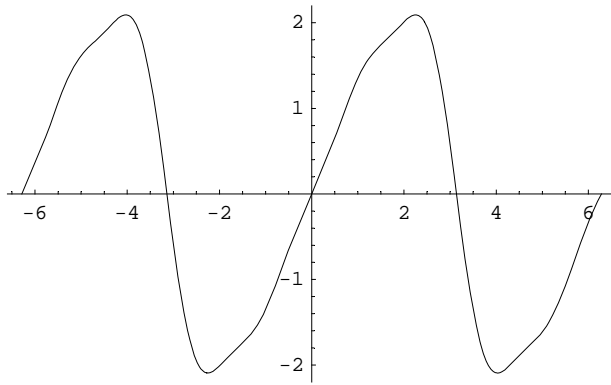




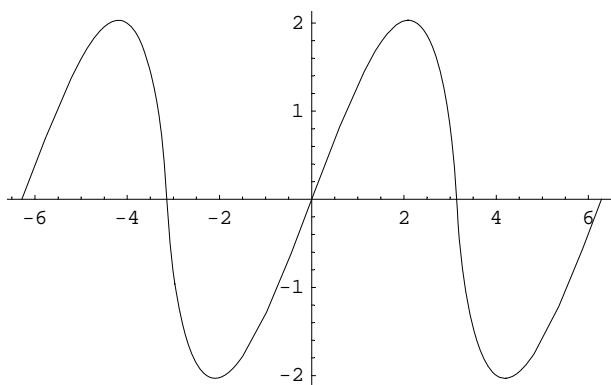
■ b2

```
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}];
```



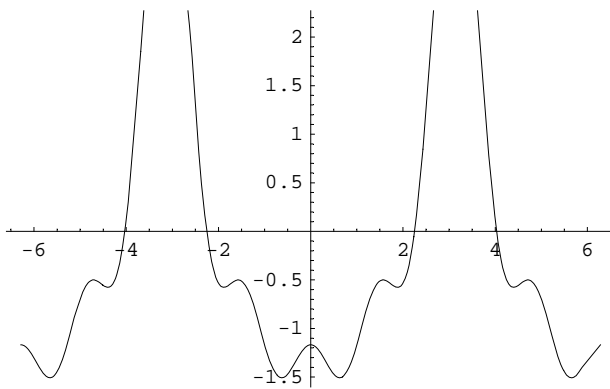
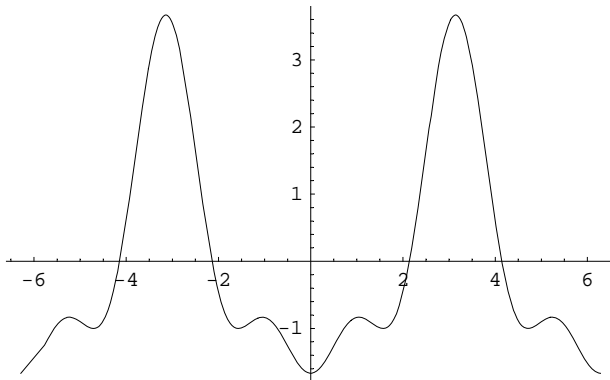
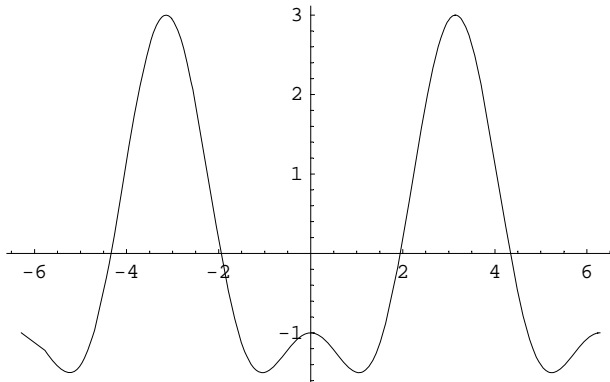
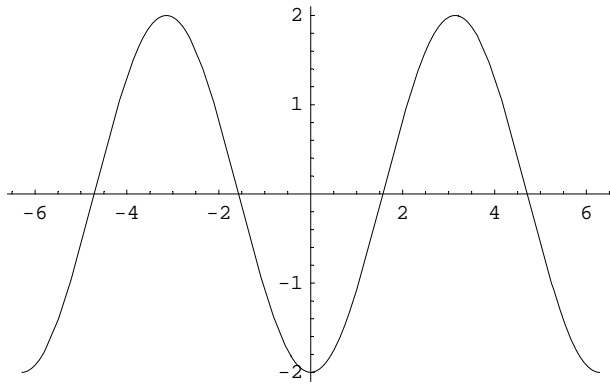


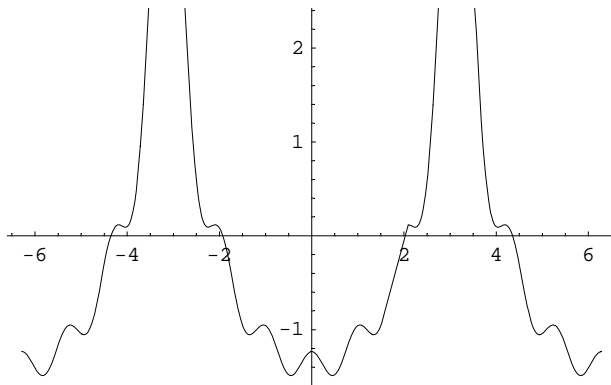
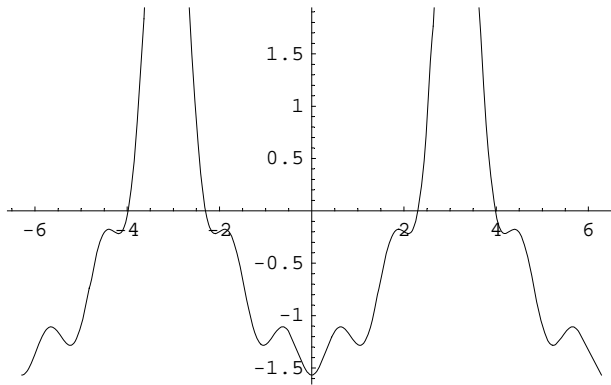
```
Plot[s[50,t],{t,-2Pi,2Pi}];
```



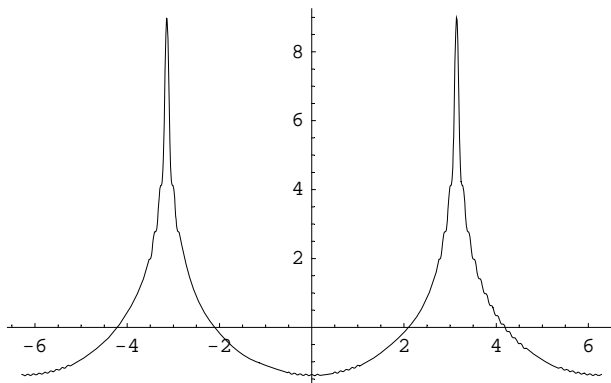
■ C

```
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}];
```



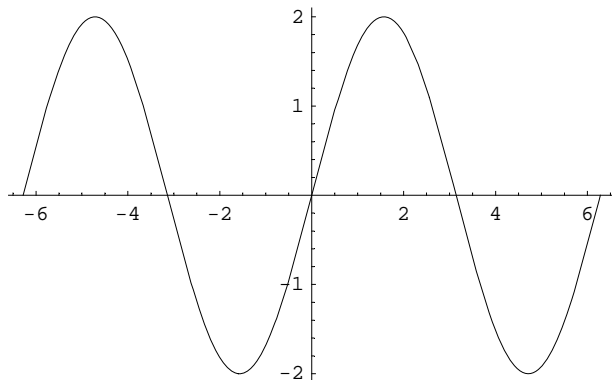


```
Plot[s[50,t],{t,-2Pi,2Pi}];
```



■ 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}];
```

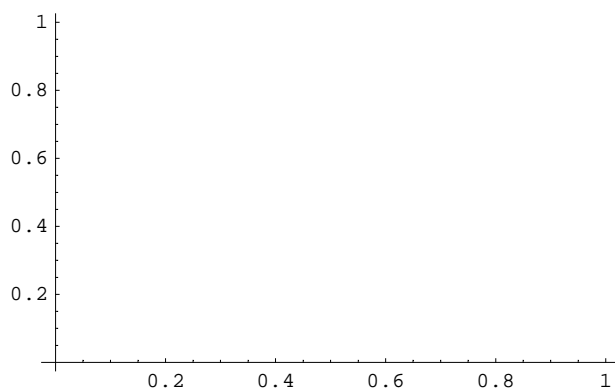


Plot::plnr : s[n, t] is not a machine-size real number at t = -6.28318. Mehr...

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

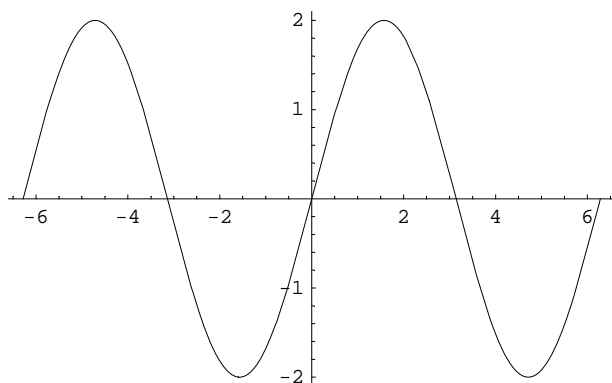
Plot::plnr : s[n, t] is not a machine-size real number at t = -5.21745. Mehr...

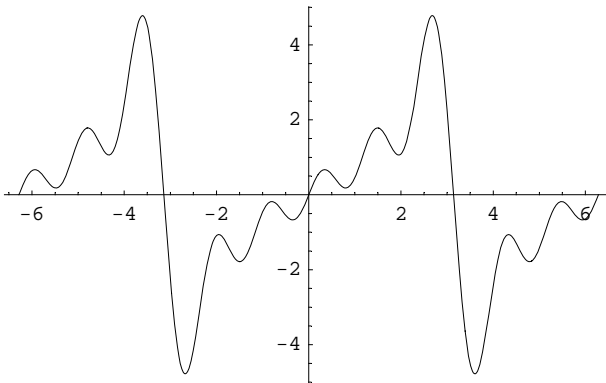
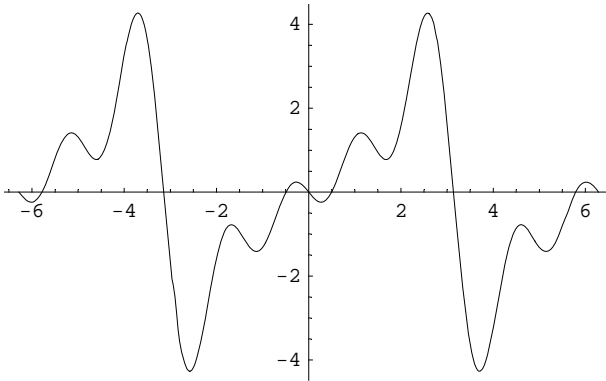
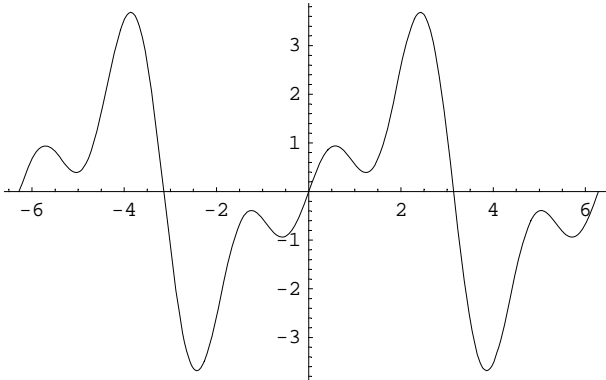
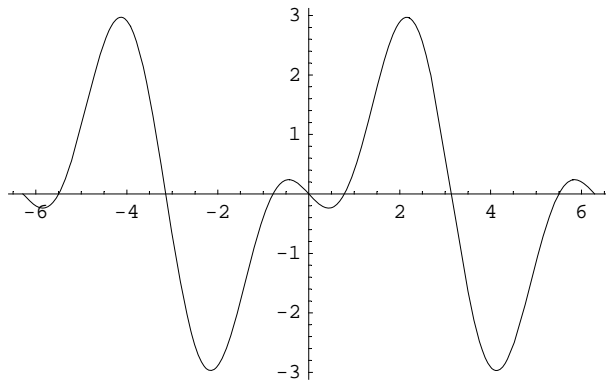
General::stop : Further output of Plot::plnr will be suppressed during this calculation. Mehr...

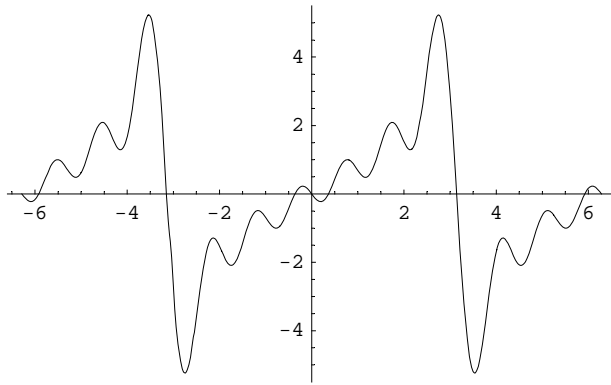


■ d2

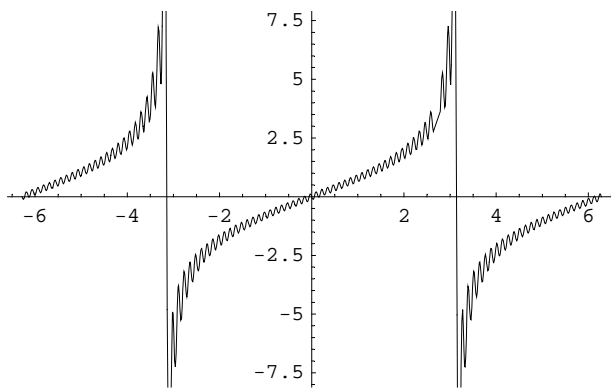
```
s[n_,t_]:= 2 Sum[(-1)^(k+1)/(k^(1/2)) Sin[k t],{k,1,n}];
Table[Plot[s[n,t],{t,-2Pi,2Pi}],{n,1,6}];
```







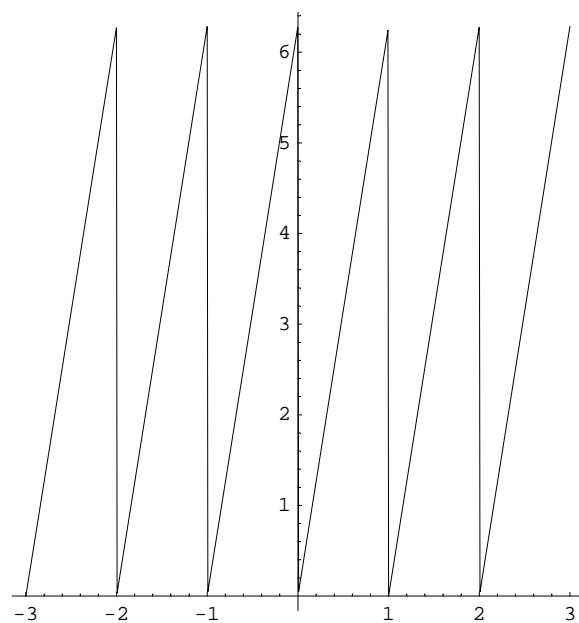
```
Plot[s[50,t],{t,-2Pi,2Pi}];
```



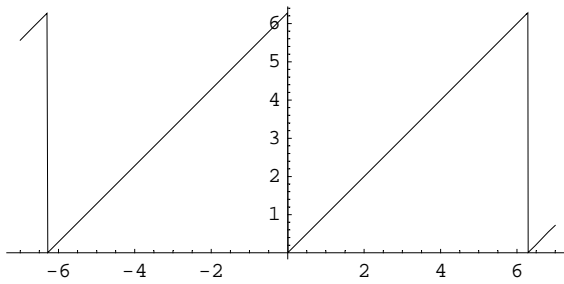
3

■ a

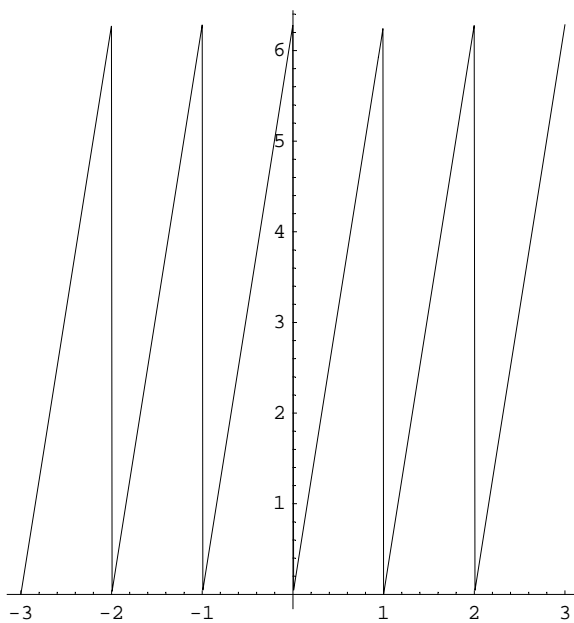
```
f[t_]:=2Pi(t-Floor[t]);  
Plot[f[t],{t,-3,3},AspectRatio->Automatic];
```



```
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*
```

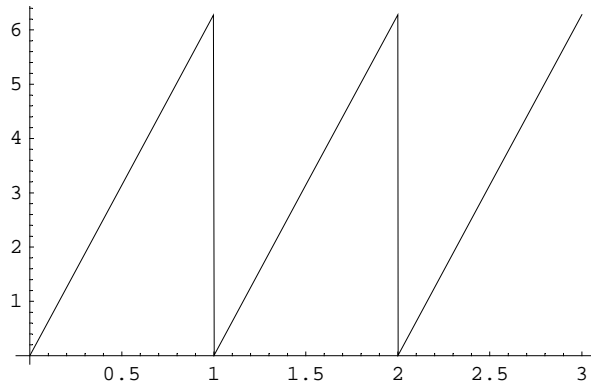
Calculus`FourierTransform`

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 $-1/2 \leq t \leq 1/2$, 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 $-1/(2 \text{Abs}[b]) \leq t \leq 1/(2 \text{Abs}[b])$, and has a period of $1/\text{Abs}[b]$. Mehr...

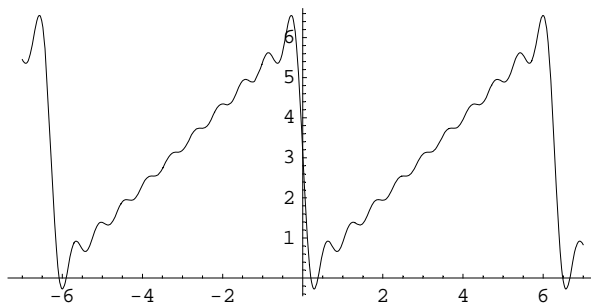
```
f[t_]:=2Pi(t-Floor[t]);
Plot[f[t],{t,0,3}];
```



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

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

```
flg10[tt_]:=FourierTrigSeries[f[t], t, 10]/.t->tt/(2 Pi);
Plot[Evaluate[flg10[tt]],{tt,-7,7},AspectRatio->Automatic];
```



■ b

?FourierTrigSeries

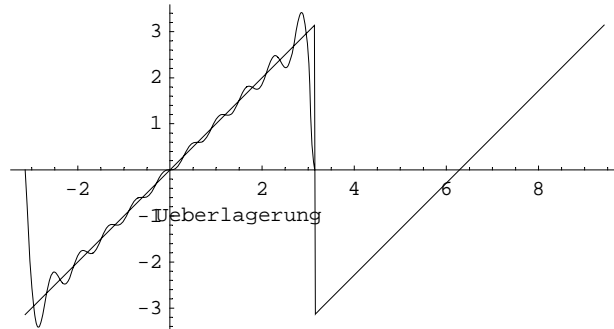
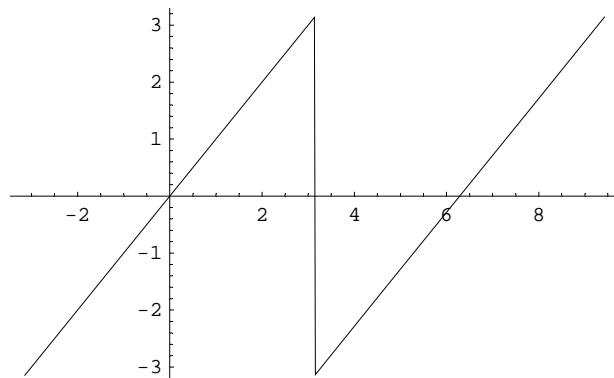
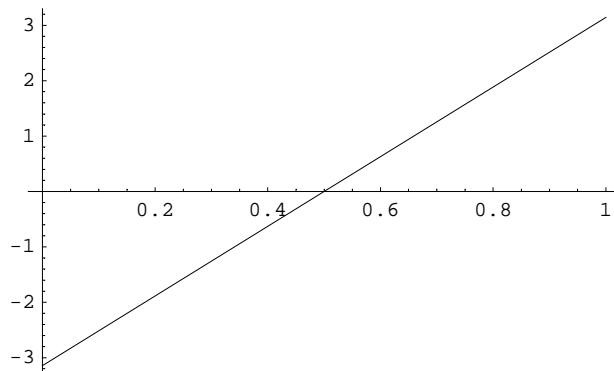
FourierTrigSeries[expr, t, k] gives the kth order Fourier trigonometric series approximation to the periodic function of t that is equal to expr for $-1/2 \leq t \leq 1/2$, and has a period of 1. FourierTrigSeries[expr, t, k, FourierParameters -> {a, b}] gives the kth order Fourier trigonometric series approximation to the periodic function of t that is equal to expr for $-1/(2 \text{Abs}[b]) \leq t \leq 1/(2 \text{Abs}[b])$, and has a period of $1/\text{Abs}[b]$. 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,PlotStyle
e->{Text["Ueberlagerung",{1.5,-1},{0,0}]}];
flg10[tt_]:=FourierTrigSeries[f[t], t, 10]/.t->tt/(2 Pi)-1/2;
p4=Plot[Evaluate[flg10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Ide
ntity];
Show[p3,p4,DisplayFunction->${DisplayFunction}];
FourierTrigSeries[f[t], t, 10];

```



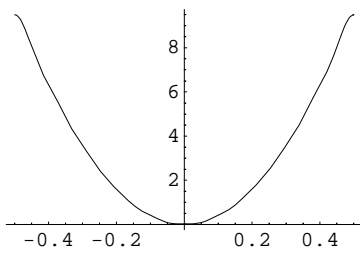
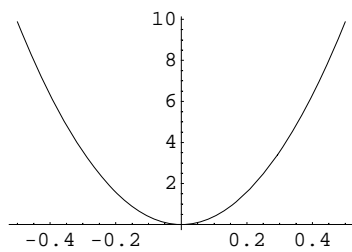
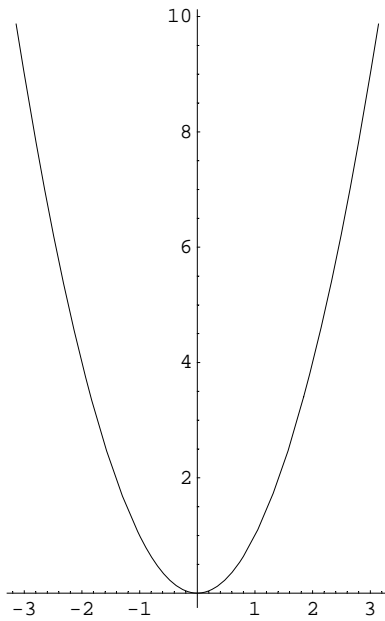
■ C

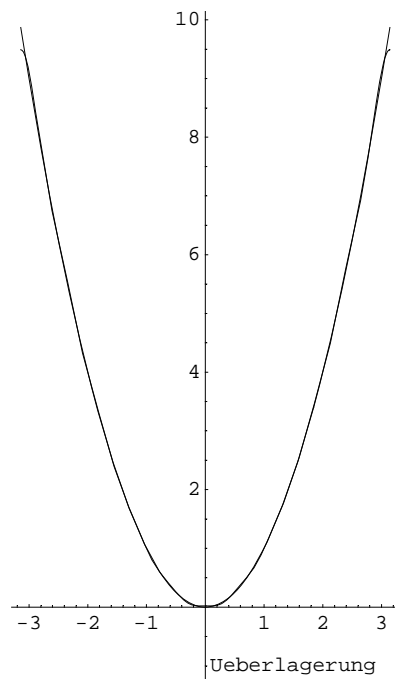
```
Remove["Global`*"]
```

```

<<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->Identity,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}];
```

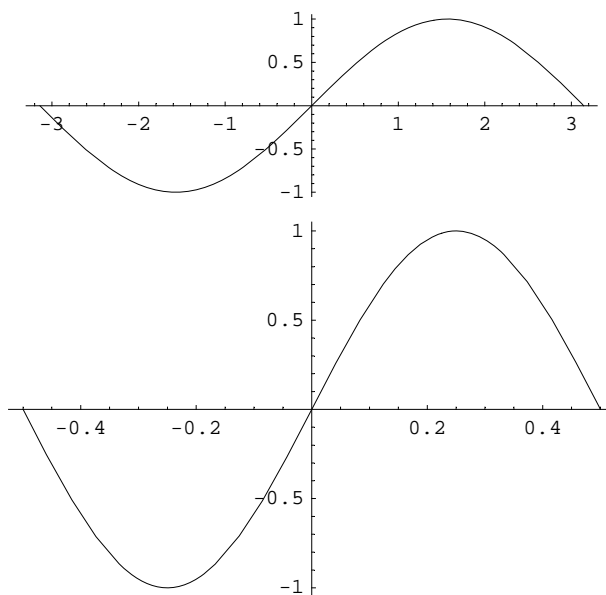
```
Plot[Evaluate[FourierTrigSeries[f1[t], t, 10]],{t,-0.5,0.5}];
```

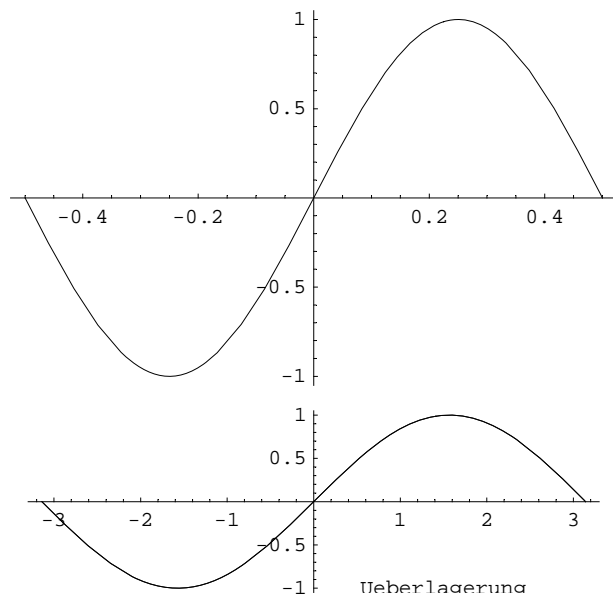
```
f1g10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);
```

```
p3=Plot[Evaluate[f1g10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Identity,PlotStyle->{Text["Ueberlagerung",{1.5,-1},{0,0}]}];
```

```
Show[p1,p3,DisplayFunction->$DisplayFunction];
```

```
FourierTrigSeries[f1[t], t, 10];
```

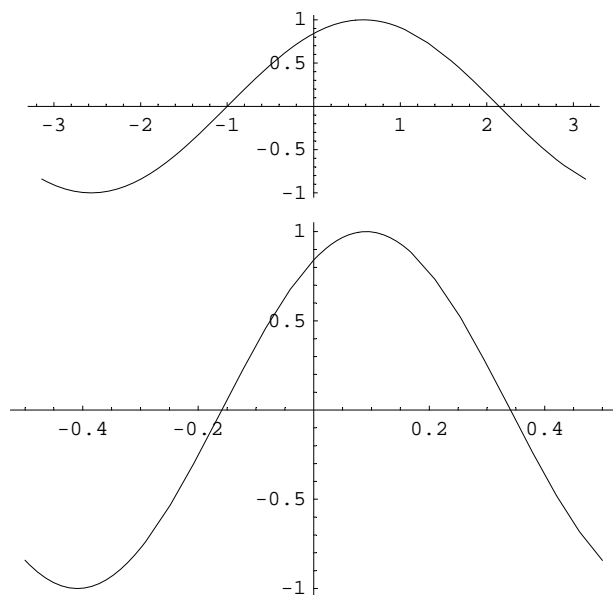


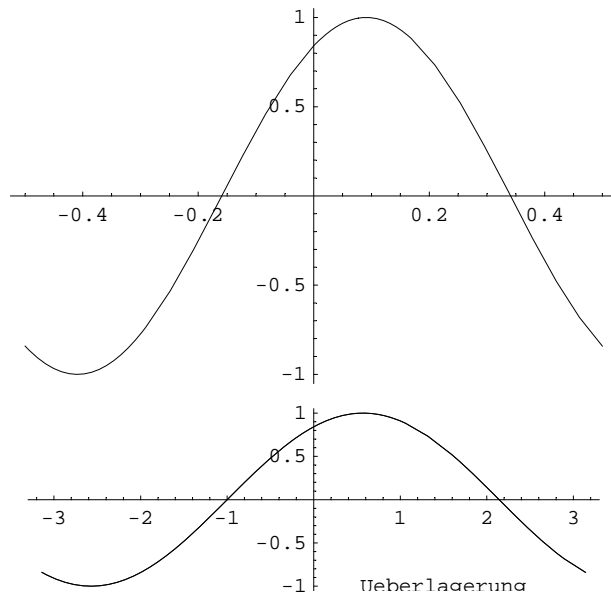


■ e

```
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}];  
flg10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);  
p3=Plot[Evaluate[flg10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Identity,PlotStyle->{Text["Ueberlagerung",{1.5,-1},{0,0}]}];  
Show[p1,p3,DisplayFunction->$DisplayFunction];  
FourierTrigSeries[f1[t], t, 10];
```

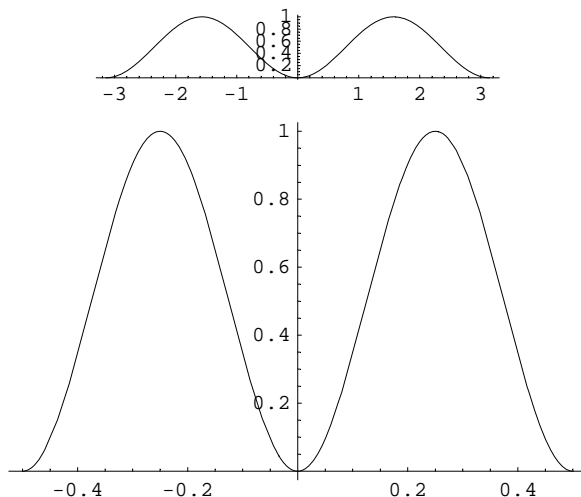


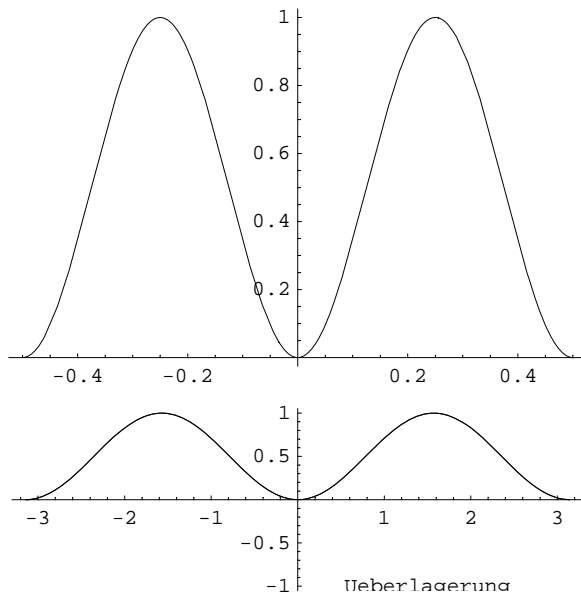


■ f

```
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}];  
flg10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);  
p3=Plot[Evaluate[flg10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Identity,PlotStyle->{Text["Ueberlagerung",{1.5,-1},{0,0}]}];  
Show[p1,p3,DisplayFunction->$DisplayFunction];  
FourierTrigSeries[f1[t], t, 10];
```

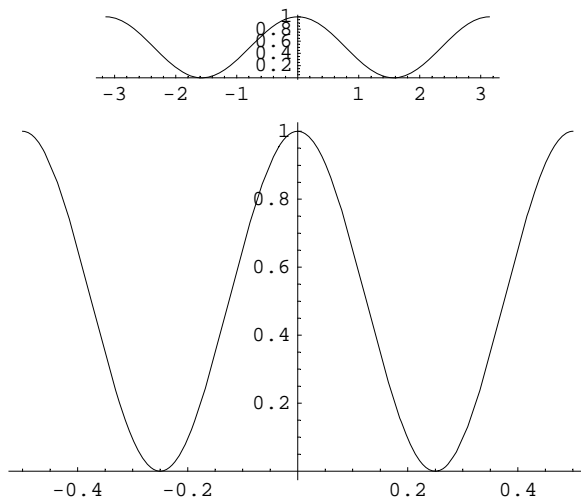


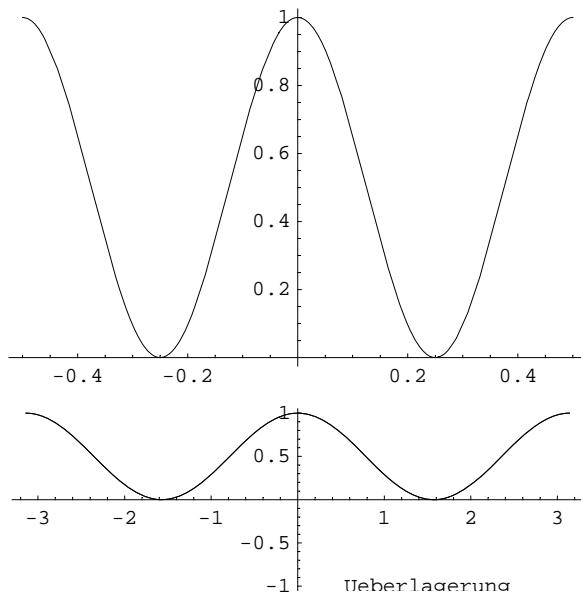


■ g

```
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}];  
flg10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);  
p3=Plot[Evaluate[flg10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Identity,PlotStyle->{Text["Ueberlagerung",{1.5,-1},{0,0}]}];  
Show[p1,p3,DisplayFunction->$DisplayFunction];  
FourierTrigSeries[f1[t], t, 10];
```

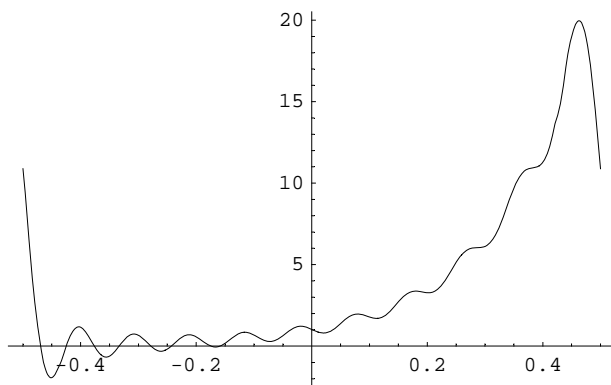
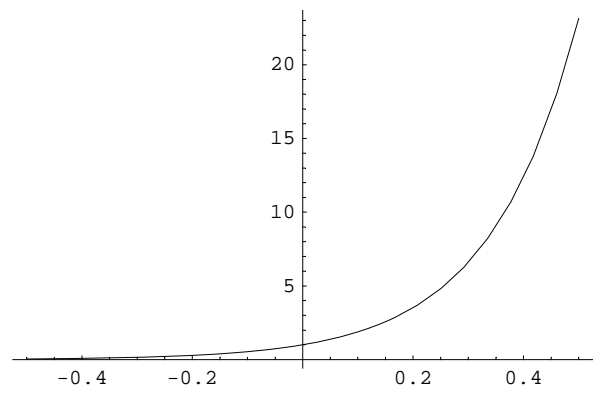
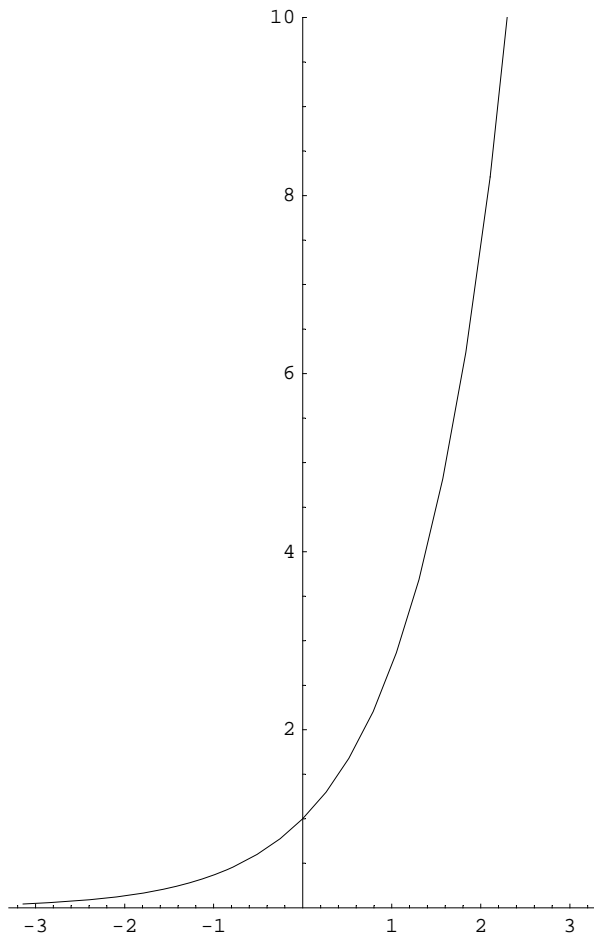


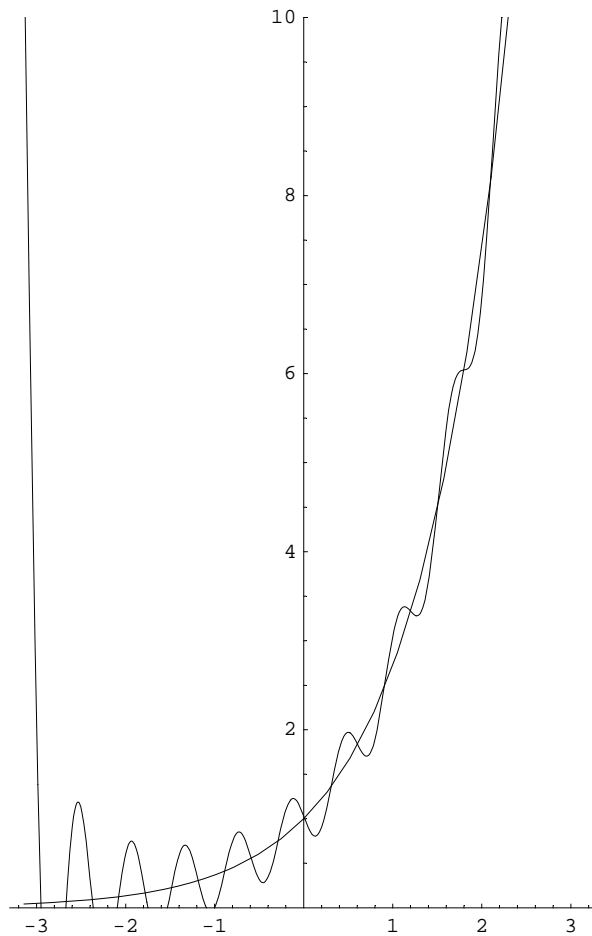


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```
Remove["Global`*"]
```

```
<<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}];
flg10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);
p3=Plot[Evaluate[flg10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Identity,PlotStyle->{Text["Ueberlagerung",{1.5,-1},{0,0}]},PlotRange->{0,10}];
Show[p1,p3,DisplayFunction->$DisplayFunction];
FourierTrigSeries[f1[t], t, 10];
```





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```
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}];  
flg10[tt_]:=FourierTrigSeries[f1[t], t, 10]/.t->tt/(2 Pi);  
p3=Plot[Evaluate[flg10[tt]],{tt,-Pi,Pi},AspectRatio->Automatic,DisplayFunction->Identity,PlotStyle->{Text["Ueberlagerung",{1.5,-1},{0,0}]},PlotRange->{0,10}];  
Show[p1,p3,DisplayFunction->$DisplayFunction];  
FourierTrigSeries[f1[t], t, 10];
```

