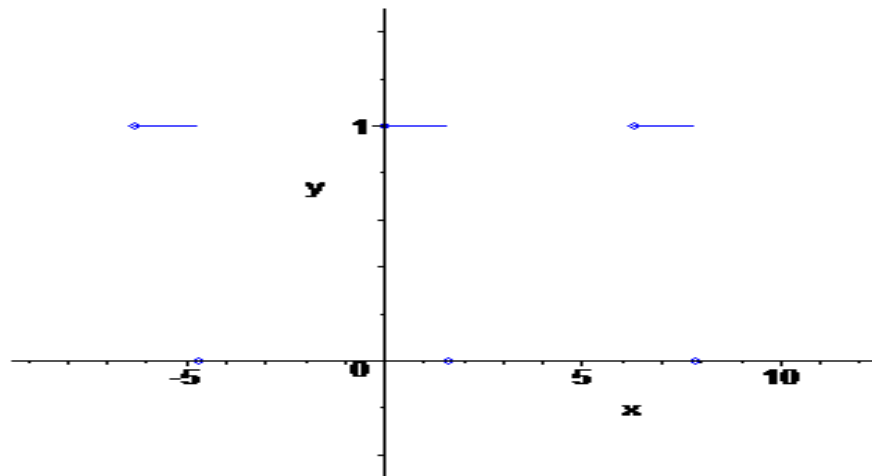


```
> restart:
with(plots):
```

Exemplo de Expansão em Série de Fourier

Consideremos a seguinte função 2π - periódica:

```
>
>
f:=x->piecewise(x<-2*Pi,0,x<-3*Pi/2,1,x<0,0,x<Pi/2,1,x<2*Pi,0
,x<5*Pi/2,1);
f:=x->piecewise(x<-2π,0,x<-3π/2,1,x<0,0,x<π/2,1,x<2π,0,x<5π/2,1)
>
plot(f(x),x=-3*Pi..4*Pi,y=-0.5..1.5,color=blue,tickmarks=[4,3
],discont=true);
```



```
> a:=k->1/Pi*int(cos(k*t),t=0..Pi/2);
```

$$a := k \rightarrow \frac{1}{\pi} \int_0^{\frac{\pi}{2}} \cos(k t) dt$$

```
> b:=k->1/Pi*int(sin(k*t),t=0..Pi/2);
```

$$b := k \rightarrow \frac{1}{\pi} \int_0^{\frac{\pi}{2}} \sin(k t) dt$$

>
A soma parcial da série de Fourier é dada por:

```
> s:=(x,n)->a(0)/2+sum(a(k)*cos(k*x)+b(k)*sin(k*x),k=1..n);
```

$$s := (x, n) \rightarrow \frac{1}{2} a(0) + \left(\sum_{k=1}^n (a(k) \cos(k x) + b(k) \sin(k x)) \right)$$

Os primeiros termos da série de Fourier são:

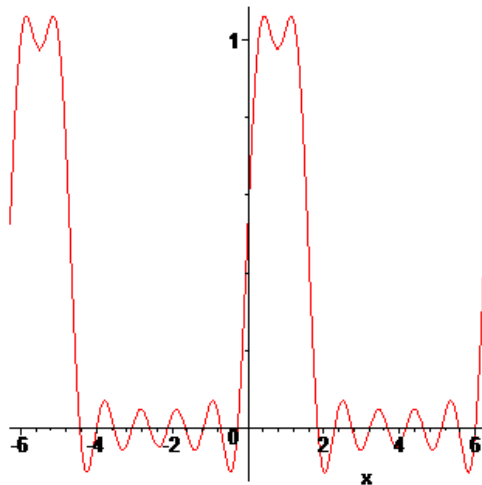
```
> s(x,5);
```

$$\frac{1}{4} + \frac{\cos(x)}{\pi} + \frac{\sin(x)}{\pi} + \frac{\sin(2x)}{\pi} - \frac{1}{3} \frac{\cos(3x)}{\pi} + \frac{1}{3} \frac{\sin(3x)}{\pi} + \frac{1}{5} \frac{\cos(5x)}{\pi} + \frac{1}{5} \frac{\sin(5x)}{\pi}$$

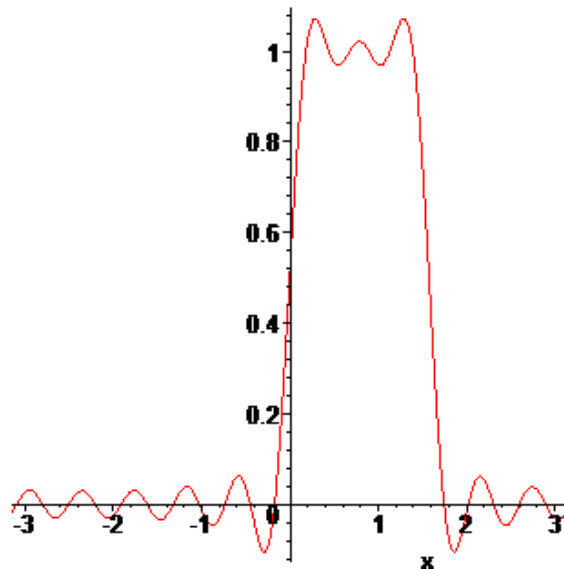
>

A seguir os gráficos de algumas somas parciais da série de Fourier da função:

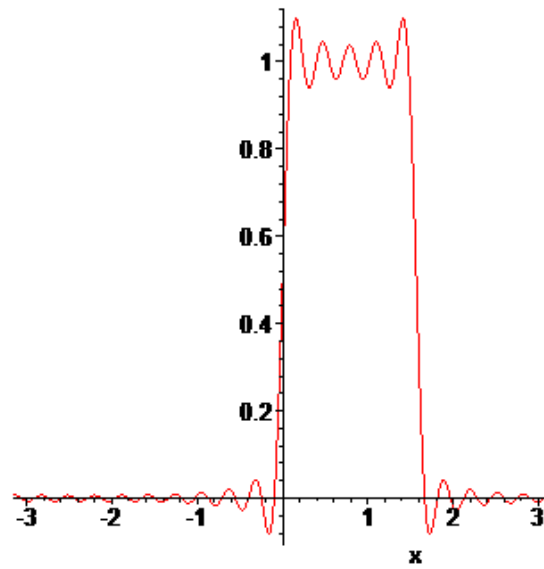
```
> plot(s(x,6),x=-2*Pi..2*Pi,tickmarks=[4,2]);
```



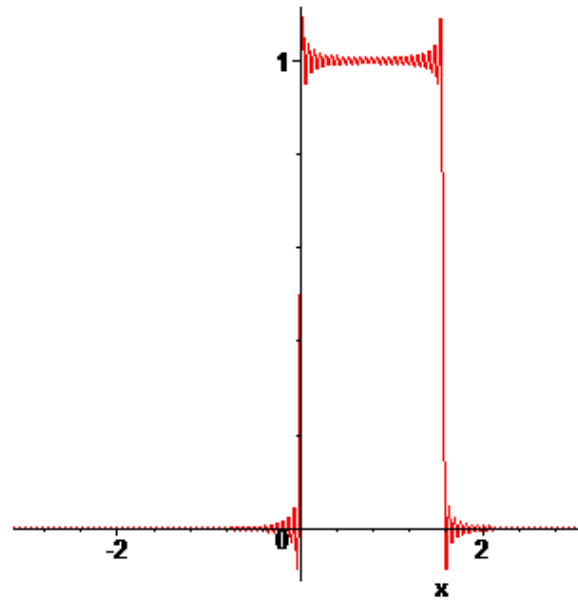
```
> plot(s(x,10),x=-Pi..Pi);
```



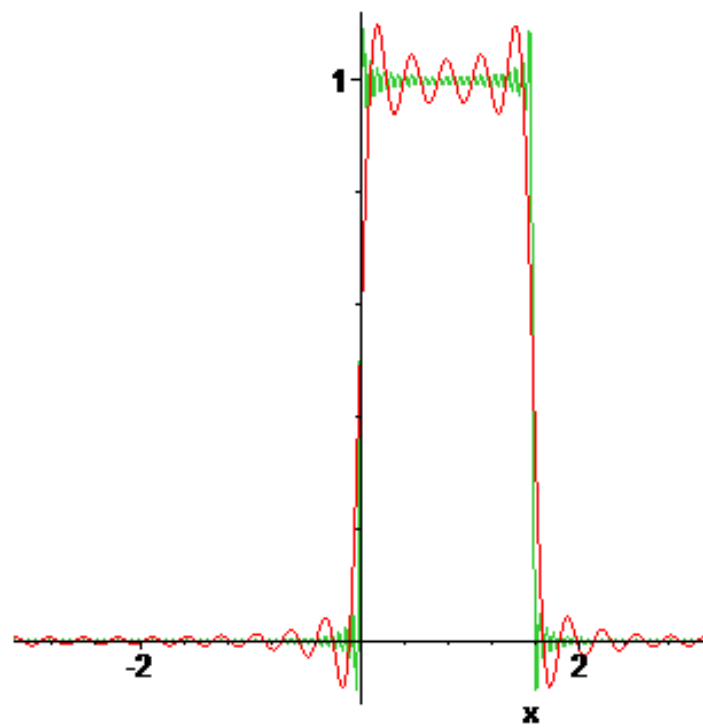
```
> plot(s(x,20),x=-Pi..Pi,numpoints=1000);
```



```
> plot(s(x,100),x=-Pi..Pi,numpoints=2000,tickmarks=[4,2]);
```



```
>
plot({s(x,20),s(x,100)},x=-Pi..Pi,numpoints=2000,tickmarks=[4,2]);
```



>

>