Gibb's phenomenon (example 9.1.1 in the book)

Step function (square wave)

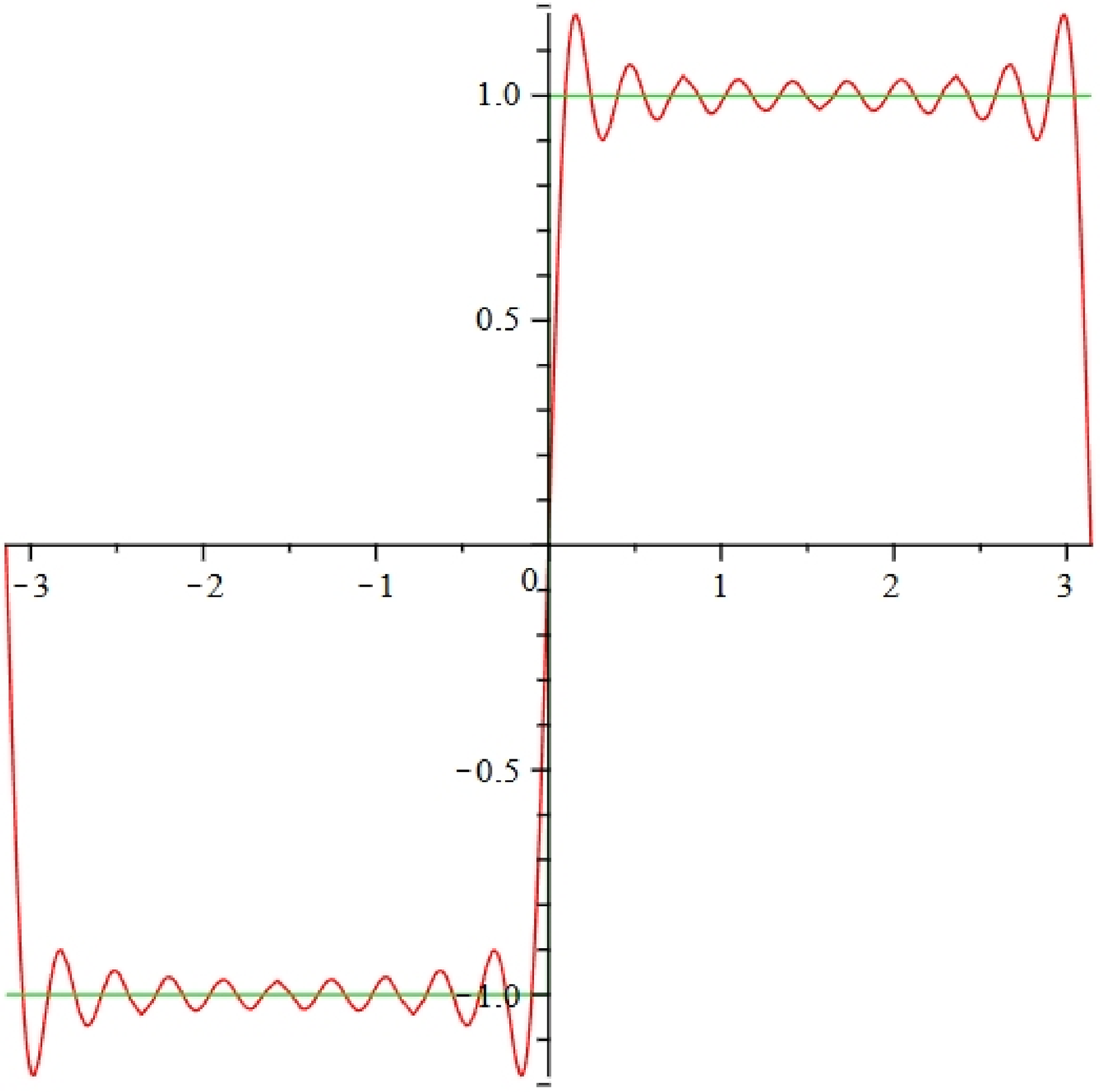
```
> stepfun := t -> piecewise(-Pi<t and t<0,-1,0<t and t<Pi,1);
```

$$stepfun := t \to piecewise(-\pi < t \text{ and } t < 0, -1, 0 < t \text{ and } t < \pi, 1) \tag{1.1}$$

```
> f := (t,N) -> (4/Pi)*sum(sin((2*k-1)*t)/(2*k-1),k=1..N);
```

$$f := (t, N) \to \frac{4\left(\sum_{k=1}^{N} \frac{\sin((2k-1)t)}{2k-1}\right)}{\pi} \tag{1.2}$$

```
> plot({f(t,10),stepfun(t)},t=-Pi..Pi);
```



Even saw tooth function

```
> sawtoothfun := t -> abs(t);
```

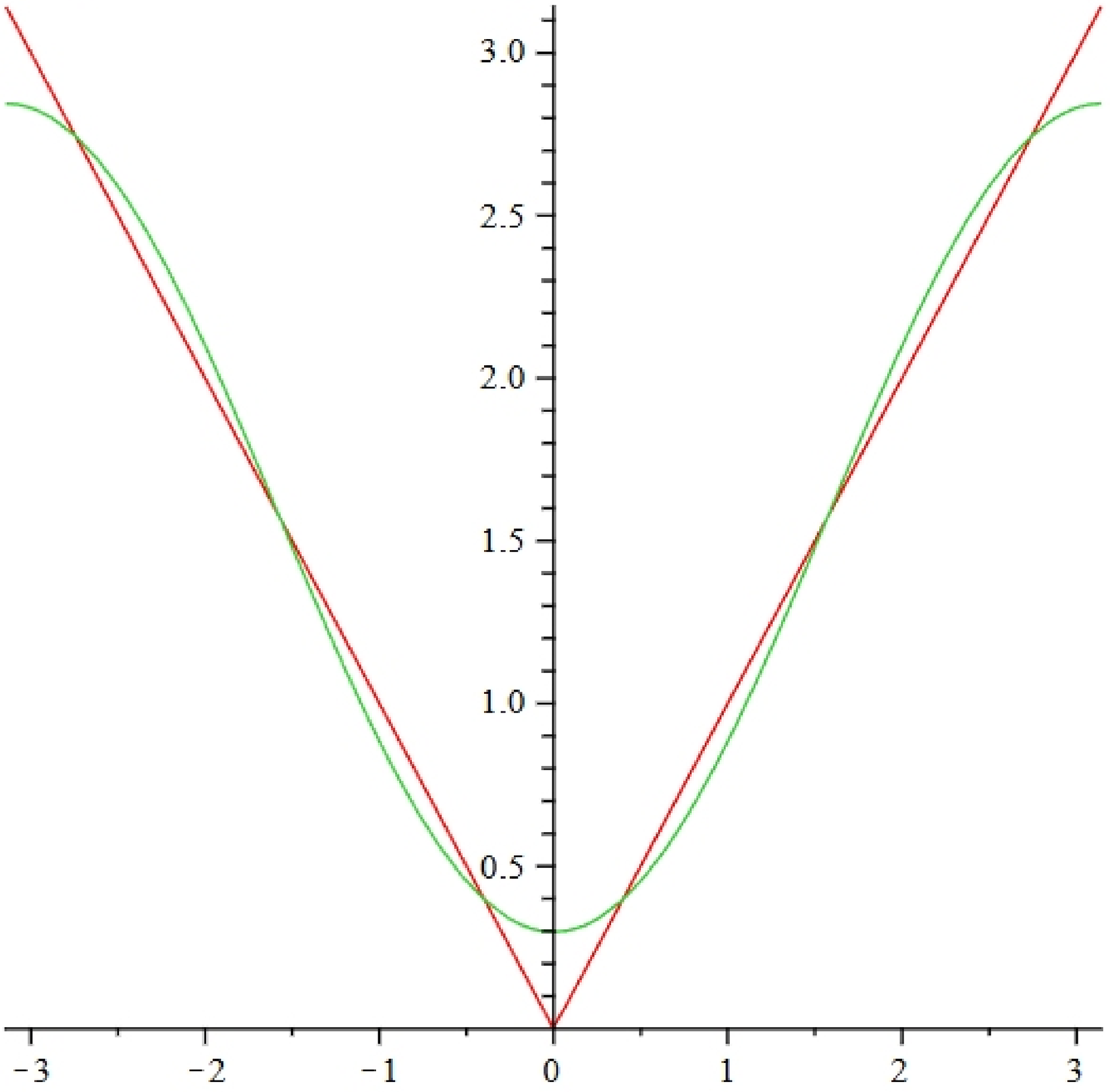
$$sawtoothfun := t \to |t| \tag{2.1}$$

```
> g := (t,N) -> Pi/2 + sum( -4*Pi*cos((2*k-1)*t)/((2*k-1)*Pi)
  ^2, k=1..N);
```

(2.2)

$$g := (t, N) \rightarrow \frac{1}{2}\,\pi + \sum_{k=1}^{N}\left(-\frac{4\,\pi\cos((2\,k-1)\,t)}{(2\,k-1)^2\,\pi^2} \right) \tag{2.2}$$

```
> plot({g(t,1),sawtoothfun(t)},t=-Pi..Pi);
```



Odd saw tooth function

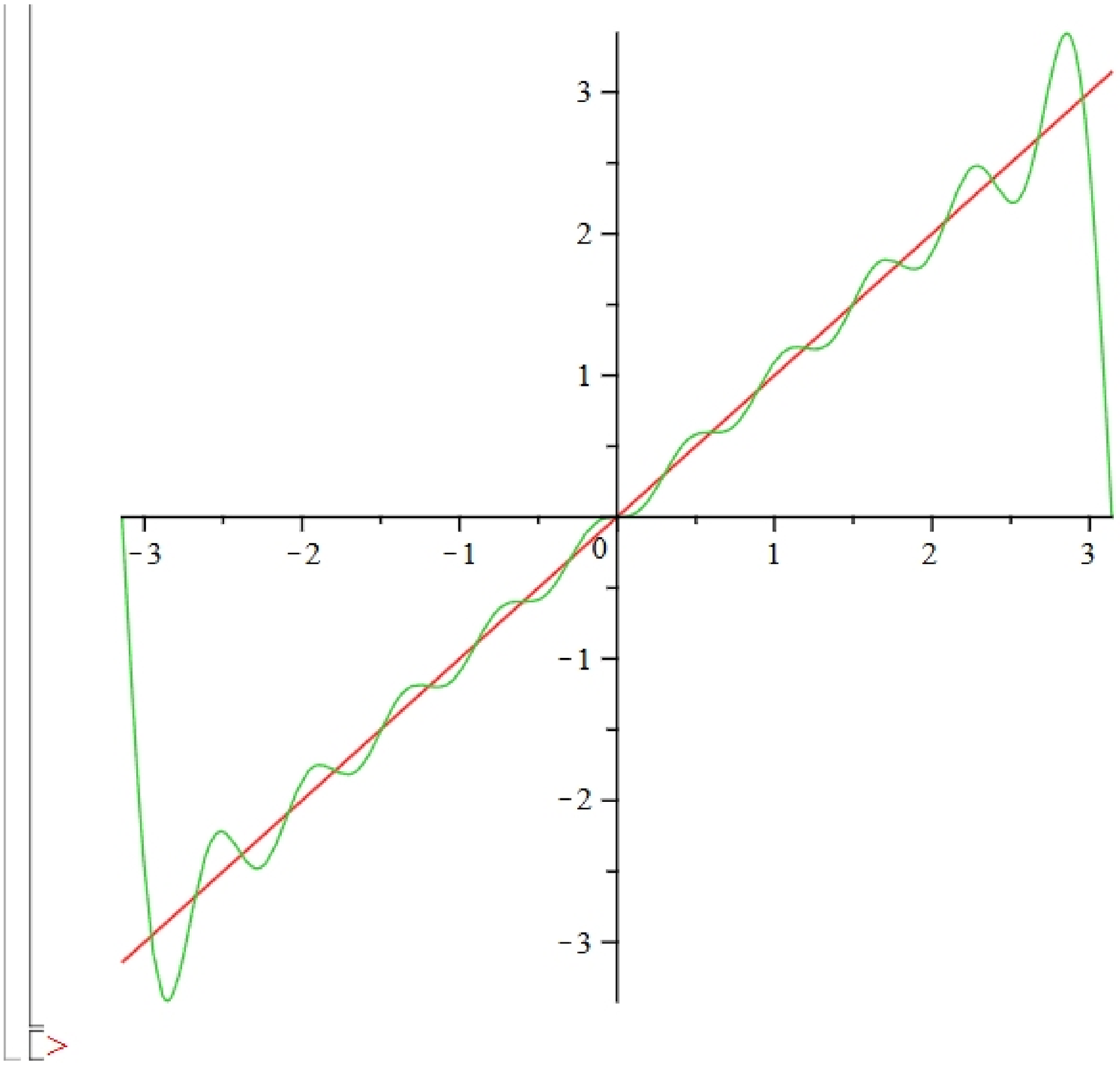
```
> sawtoothfun2 := t -> t;
```

$$sawtoothfun2 := t \rightarrow t \tag{3.1}$$

```
> h := (t,N) -> sum( (-1)^(n+1) * (2/n) * sin(n*t), n=1..N);
```

$$h := (t, N) \rightarrow \sum_{n=1} \frac{2\,(-1)^{n+1}\sin(n\,t)}{n} \tag{3.2}$$

```
> plot({h(t,10),sawtoothfun2(t)},t=-Pi..Pi);
```


3
2
1
−3
−2
−1
0
1
2
3
−1
−2
−3