

> *with*(plots); *fe* := **proc**(*f*) *fnormal*(*evalf*(*f*)); **end**: (1)  
 [animate, animate3d, animatecurve, arrow, changecoords, complexplot, complexplot3d,  
 conformal, conformal3d, contourplot, contourplot3d, coordplot, coordplot3d, densityplot,  
 display, dualaxisplot, fieldplot, fieldplot3d, gradplot, gradplot3d, implicitplot, implicitplot3d,  
 inequal, interactive, interactiveparams, intersectplot, listcontplot, listcontplot3d,  
 listdensityplot, listplot, listplot3d, loglogplot, logplot, matrixplot, multiple, odeplot, pareto,  
 plotcompare, pointplot, pointplot3d, polarplot, polygonplot, polygonplot3d,  
 polyhedra\_supported, polyhedraplot, rootlocus, semilogplot, setcolors, setoptions,  
 setoptions3d, spacecurve, sparsematrixplot, surfdata, textplot, textplot3d, tubeplot]

> *b* := **proc**(*f*, *n*)  
**if** *n* = 0 **then** 0;  
**else** *fe*  $\left( \frac{2}{L} \cdot \int_0^L f \cdot \sin\left(\frac{n \cdot \pi \cdot x}{L}\right) dx \right)$ ;  
**fi**;  
**end**:  
 > *L* := 1; *fun* := 
$$\begin{cases} \frac{2x}{L} & 0 < x < \frac{L}{2} \\ \frac{2}{L}(L-x) & L > x \geq \frac{L}{2} \\ L := 1 \end{cases}$$
  

$$fun := \begin{cases} 2x & 0 < x \text{ and } x < \frac{1}{2} \\ 2 - 2x & x < 1 \text{ and } \frac{1}{2} \leq x \end{cases}$$
 (2)

> *fun\_odd* := (*f*, *n*) →  $\sum_{k=1}^n 'b(f, k) \cdot \sin\left(\frac{k \cdot \pi \cdot x}{L}\right)'$ ; *n* := 20; *fun\_odd*(*fun*, *n*);  
 plot({*fun\_odd*(*fun*, *n*)}, x = -L .. 2L)

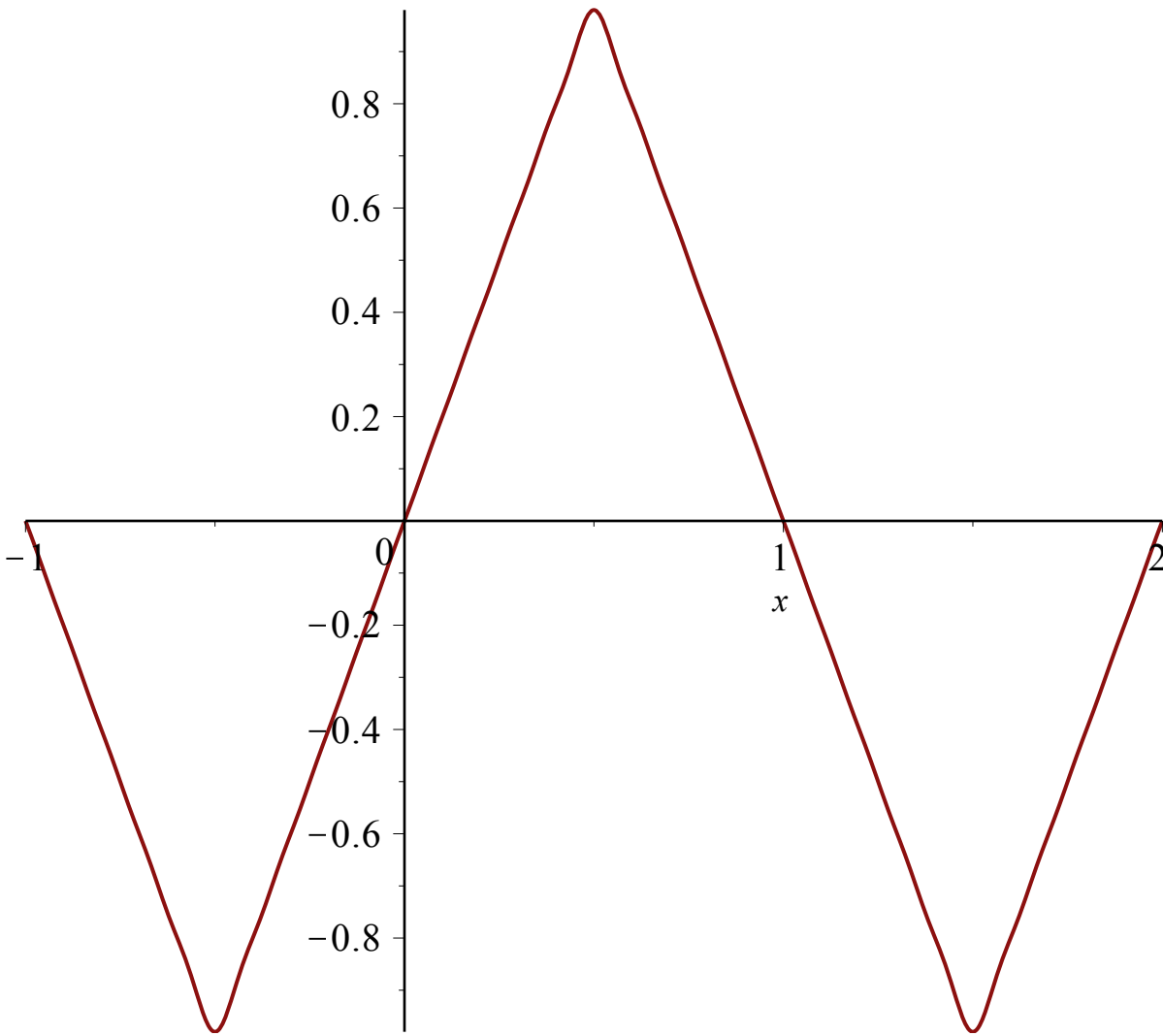
$$fun\_odd := (f, n) \rightarrow \sum_{k=1}^n 'b(f, k) \sin\left(\frac{k \pi x}{L}\right),$$

*n* := 20

$$\begin{aligned} & 0.8105694688 \sin\left(\frac{\pi x}{L}\right) - 0.09006327431 \sin\left(\frac{3 \pi x}{L}\right) + 0.03242277875 \sin\left(\frac{5 \pi x}{L}\right) \\ & - 0.01654223405 \sin\left(\frac{7 \pi x}{L}\right) + 0.01000703048 \sin\left(\frac{9 \pi x}{L}\right) \\ & - 0.006698921230 \sin\left(\frac{11 \pi x}{L}\right) + 0.004796269047 \sin\left(\frac{13 \pi x}{L}\right) \end{aligned}$$

$$- 0.003602530973 \sin\left(\frac{15 \pi x}{L}\right) + 0.002804738646 \sin\left(\frac{17 \pi x}{L}\right)$$

$$- 0.002245344789 \sin\left(\frac{19 \pi x}{L}\right)$$



$$> \text{fun\_sol} := (f, n) \rightarrow \sum_{k=1}^n 'b(f, k) \cdot \sin\left(\frac{k \cdot \pi \cdot x}{L}\right) \cdot e^{-\left(\frac{c \cdot k \cdot \pi}{L}\right)^2 \cdot t},$$

$$\text{fun\_even} := (f, n) \rightarrow \sum_{k=1}^n 'b(f, k) \sin\left(\frac{k \pi x}{L}\right),$$

$$\text{fun\_sol} := (f, n) \rightarrow \sum_{k=1}^n 'b(f, k) \sin\left(\frac{k \pi x}{L}\right) e^{-\frac{c^2 k^2 \pi^2 t}{L^2}},$$

**(3)**

> n := 20; fun\_sol(fun, n);

n := 20

$$\begin{aligned}
& 0.8105694688 \sin\left(\frac{\pi x}{L}\right) e^{-\frac{c^2 \pi^2 t}{L^2}} - 0.09006327431 \sin\left(\frac{3 \pi x}{L}\right) e^{-\frac{9 c^2 \pi^2 t}{L^2}} \\
& + 0.03242277875 \sin\left(\frac{5 \pi x}{L}\right) e^{-\frac{25 c^2 \pi^2 t}{L^2}} - 0.01654223405 \sin\left(\frac{7 \pi x}{L}\right) e^{-\frac{49 c^2 \pi^2 t}{L^2}} \\
& + 0.01000703048 \sin\left(\frac{9 \pi x}{L}\right) e^{-\frac{81 c^2 \pi^2 t}{L^2}} - 0.006698921230 \sin\left(\frac{11 \pi x}{L}\right) e^{-\frac{121 c^2 \pi^2 t}{L^2}} \\
& + 0.004796269047 \sin\left(\frac{13 \pi x}{L}\right) e^{-\frac{169 c^2 \pi^2 t}{L^2}} \\
& - 0.003602530973 \sin\left(\frac{15 \pi x}{L}\right) e^{-\frac{225 c^2 \pi^2 t}{L^2}} \\
& + 0.002804738646 \sin\left(\frac{17 \pi x}{L}\right) e^{-\frac{289 c^2 \pi^2 t}{L^2}} \\
& - 0.002245344789 \sin\left(\frac{19 \pi x}{L}\right) e^{-\frac{361 c^2 \pi^2 t}{L^2}}
\end{aligned} \tag{4}$$

>  $c := 0.1$ ;  $animate(plot, [\{fun\_sol(fun, n)\}, x = 0..L], t = 0..20, frames = 100)$   
 $c := 0.1$

