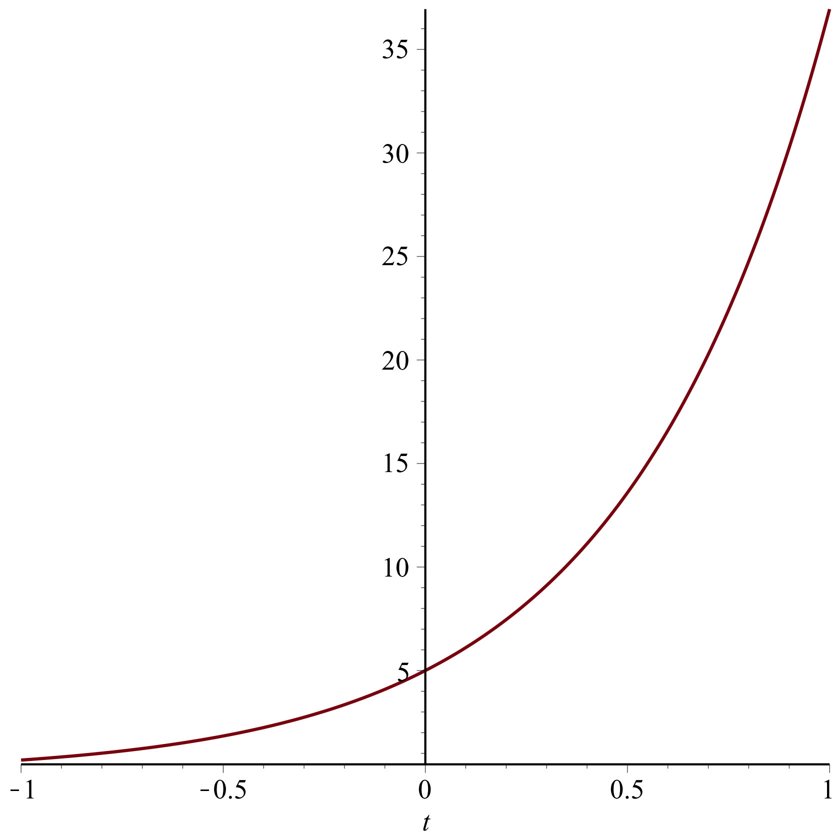
> *restart*

> $f(t) := 5 \cdot \exp(2 \cdot t)$

$$f(t) := 5\,\mathrm{e}^{2\,t} \tag{1}$$

> $plot(f(t), t = -1 ..1)$



> $L := 1$

$$L := 1 \tag{2}$$

> $a[0] := \frac{1}{L} \cdot int(f(t), t = -L..L); evalf(\%, 5)$

$$a_0 := -\frac{5}{2}\,\mathrm{e}^{-2} + \frac{5}{2}\,\mathrm{e}^{2}$$

$$18.135 \tag{3}$$

> $C := \frac{a[0]}{2}; evalf(\%, 5)$

$$C := -\frac{5}{4}\,\mathrm{e}^{-2} + \frac{5}{4}\,\mathrm{e}^{2}$$

$$9.0672 \tag{4}$$

> $a[n] := subs\left(\sin(n \cdot \mathrm{Pi}) = 0, \cos(n \cdot \mathrm{Pi}) = (-1)^n, \frac{1}{L} \cdot int\left(f(t) \cdot \cos\left(\frac{n \cdot \mathrm{Pi}}{L} \cdot t\right), t = -L..L\right)\right)$

$$a_n := \frac{5\left(2\,e^{2}\,(-1)^{n} - 2\,e^{-2}\,(-1)^{n}\right)}{\pi^{2}\,n^{2}+4} \tag{5}$$

> $b[n] := subs\left(\sin(n\cdot\mathrm{Pi}) = 0, \cos(n\cdot\mathrm{Pi}) = (-1)^{n}, \frac{1}{L}\cdot int\left(f(t)\cdot\sin\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right), t=-L..L\right)\right)$

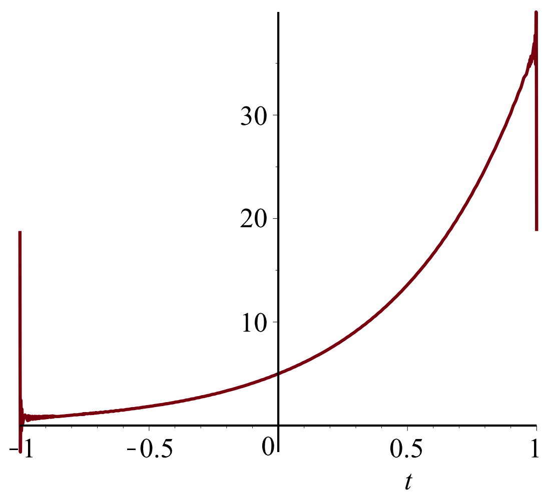
$$b_n := \frac{5\left(-e^{2}\,(-1)^{n}\,\pi\,n + e^{-2}\,(-1)^{n}\,\pi\,n\right)}{\pi^{2}\,n^{2}+4} \tag{6}$$

> $STFf := C + Sum\left(a[n]\cdot\cos\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right) + b[n]\cdot\sin\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right), n=1..infinity\right)$

$$STFf := -\frac{5}{4}\,e^{-2} + \frac{5}{4}\,e^{2} + \sum_{n=1}^{\infty}\left(\frac{5\left(2\,e^{2}\,(-1)^{n} - 2\,e^{-2}\,(-1)^{n}\right)\cos(n\,\pi\,t)}{\pi^{2}\,n^{2}+4} + \frac{5\left(-e^{2}\,(-1)^{n}\,\pi\,n + e^{-2}\,(-1)^{n}\,\pi\,n\right)\sin(n\,\pi\,t)}{\pi^{2}\,n^{2}+4}\right) \tag{7}$$

> $STFf500 := C + sum\left(a[n]\cdot\cos\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right) + b[n]\cdot\sin\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right), n=1..500\right):$

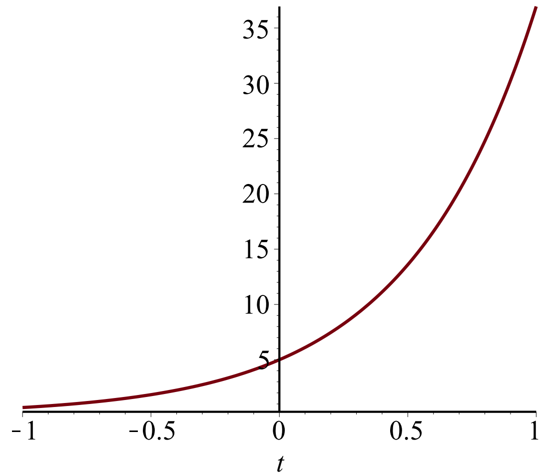
> $plot(STFf500, t=-1..1)$



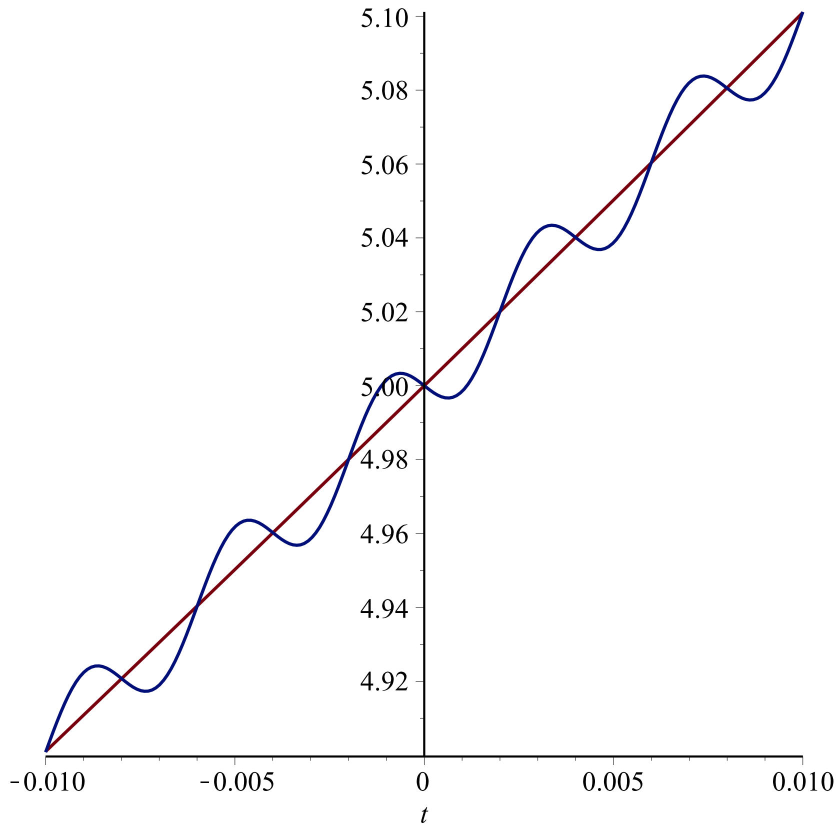
> $f(t)$

$$5\,e^{2\,t} \tag{8}$$

> $plot(f(t), t=-1..1)$

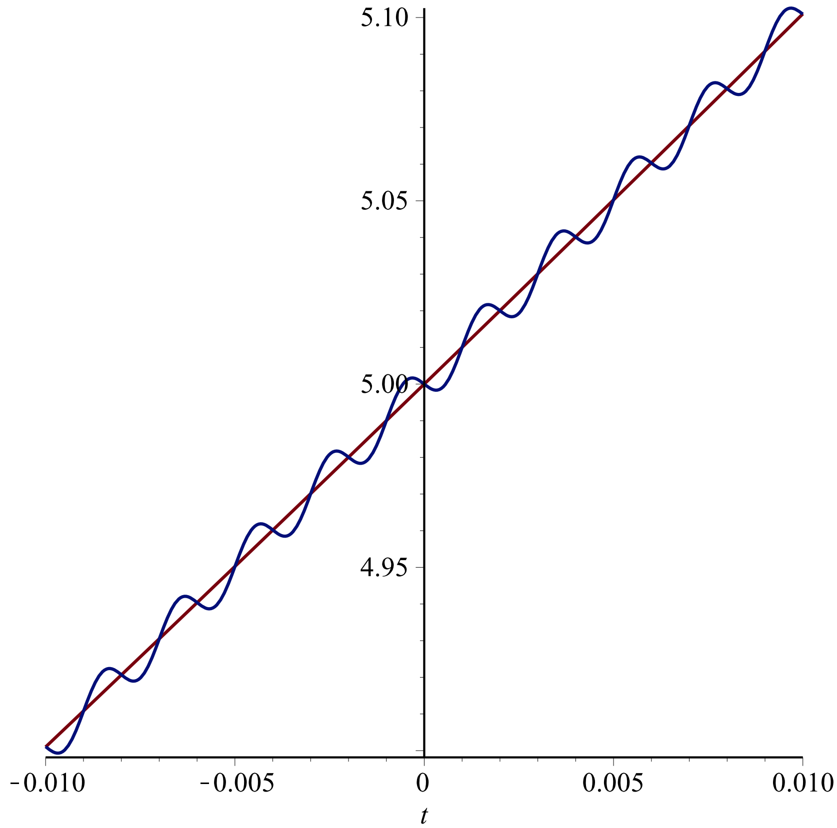


> $plot([f(t), STFf500], t=-0.01..0.01)$



> $STFf1000 := C + sum\left(a[n]\cdot\cos\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right) + b[n]\cdot\sin\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right), n=1..1000\right):$

> $plot([f(t), STFf1000], t=-0.01..0.01)$



> $L := 5$

$$L := 5 \tag{9}$$

> $aa[0] := \frac{1}{L} \cdot int(f(t), t=-L..L);\ evalf(\%, 7)$

$$aa_0 := -\frac{1}{2}\,e^{-10} + \frac{1}{2}\,e^{10}$$
$$11013.24 \tag{10}$$

> $CC := \frac{aa[0]}{2};\ evalf(\%, 7)$

$$CC := -\frac{1}{4}\,e^{-10} + \frac{1}{4}\,e^{10}$$
$$5506.618 \tag{11}$$

> $aa[n] := subs\left(\sin(n\cdot\mathrm{Pi}) = 0, \cos(n\cdot\mathrm{Pi}) = (-1)^n, \frac{1}{L}\cdot int\left(f(t)\cdot\cos\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right), t=-L..L\right)\right)$

$$aa_n := \frac{5\left(10\,e^{10}\,(-1)^n - 10\,e^{-10}\,(-1)^n\right)}{\pi^2\,n^2 + 100} \tag{12}$$

> $bb[n] := subs\left(\sin(n\cdot\text{Pi})=0, \cos(n\cdot\text{Pi})=(-1)^n, \frac{1}{L}\cdot int\left(f(t)\cdot\sin\left(\frac{n\cdot\text{Pi}}{L}\cdot t\right), t=-L..L\right)\right)$

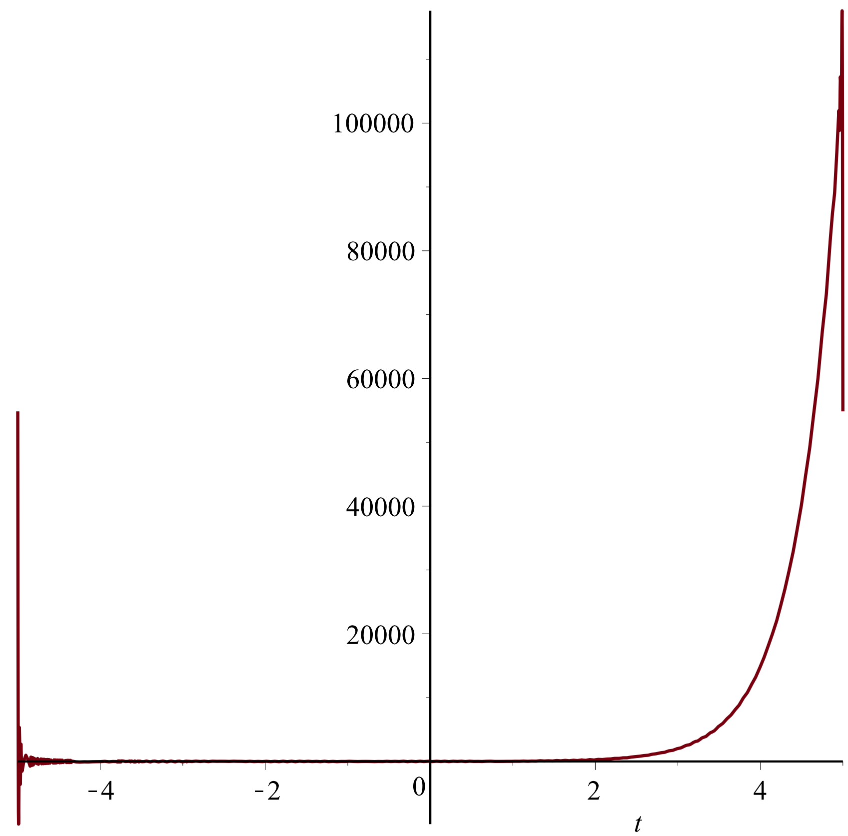
$$bb_n := -\frac{5\left(e^{10}(-1)^n \pi n - e^{-10}(-1)^n \pi n\right)}{\pi^2 n^2 + 100} \tag{13}$$

> $STFFf := CC + Sum\left(aa[n]\cdot\cos\left(\frac{n\cdot\text{Pi}}{L}\cdot t\right) + bb[n]\cdot\sin\left(\frac{n\cdot\text{Pi}}{L}\cdot t\right), n=1..infinity\right)$

$$STFFf := -\frac{1}{4}e^{-10} + \frac{1}{4}e^{10} + \sum_{n=1}^{\infty}\left(\frac{5\left(10\,e^{10}(-1)^n - 10\,e^{-10}(-1)^n\right)\cos\left(\frac{1}{5}n\pi t\right)}{\pi^2 n^2 + 100} - \frac{5\left(e^{10}(-1)^n \pi n - e^{-10}(-1)^n \pi n\right)\sin\left(\frac{1}{5}n\pi t\right)}{\pi^2 n^2 + 100}\right) \tag{14}$$

> $STFFf500 := CC + sum\left(aa[n]\cdot\cos\left(\frac{n\cdot\text{Pi}}{L}\cdot t\right) + bb[n]\cdot\sin\left(\frac{n\cdot\text{Pi}}{L}\cdot t\right), n=1..500\right):$

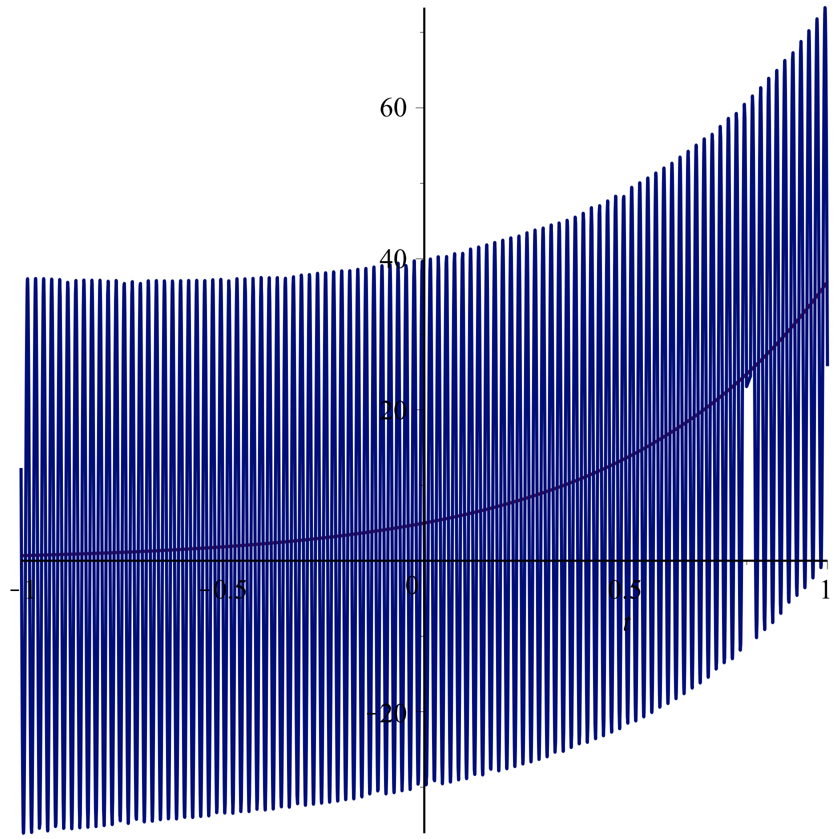
> $plot(STFFf500, t=-5..5)$



> $f(t)$

$$5\,e^{2t} \tag{15}$$

> $plot([f(t), STFFf500], t=-1..1)$

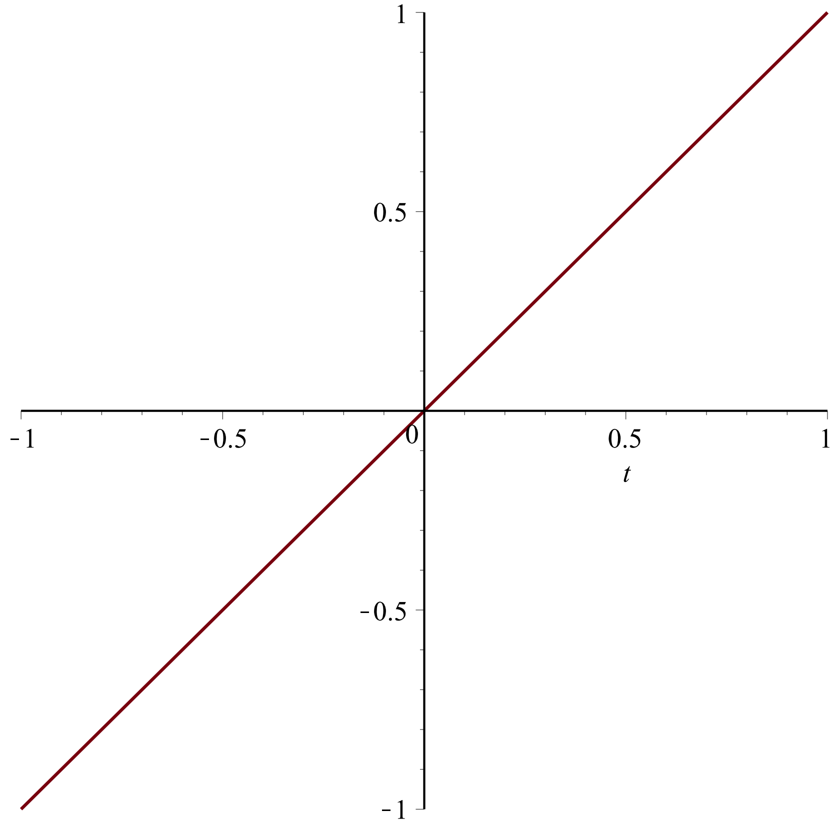


> $restart$

> $g := t$

$$g := t \tag{16}$$

> $plot(g, t=-1..1)$



> $L := 1$

$$L := 1 \tag{17}$$

> $a[0] := \frac{1}{L} \cdot int(g, t = -L..L)$

$$a_0 := 0 \tag{18}$$

> $C := \frac{a[0]}{2}$

$$C := 0 \tag{19}$$

> $a[n] := \frac{1}{L} \cdot int\left(g \cdot \cos\left(\frac{n \cdot \mathrm{Pi}}{L} \cdot t\right), t = -L..L\right)$

$$a_n := 0 \tag{20}$$

> $b[n] := subs\left(\sin(n \cdot \mathrm{Pi}) = 0, \cos(n \cdot \mathrm{Pi}) = (-1)^n, \frac{1}{L} \cdot int\left(g \cdot \sin\left(\frac{n \cdot \mathrm{Pi}}{L} \cdot t\right), t = -L..L\right)\right)$

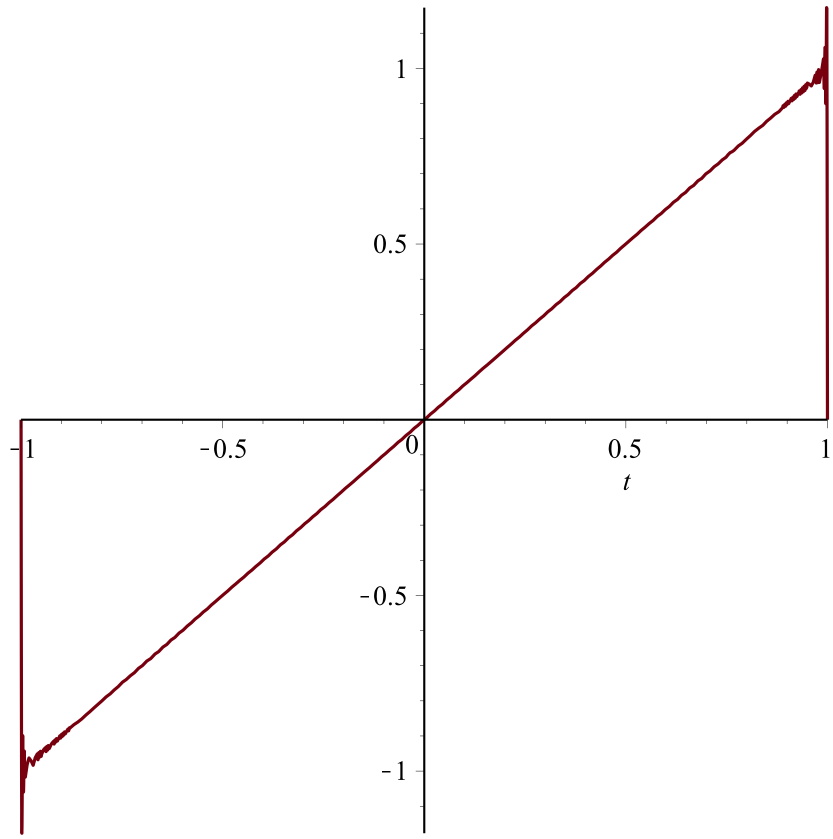
$$b_n := -\frac{2\,(-1)^n}{n\,\pi} \tag{21}$$

> $STFg := Sum\left(b[n] \cdot \sin\left(\frac{n \cdot \mathrm{Pi}}{L} \cdot t\right), n = 1..infinity\right)$

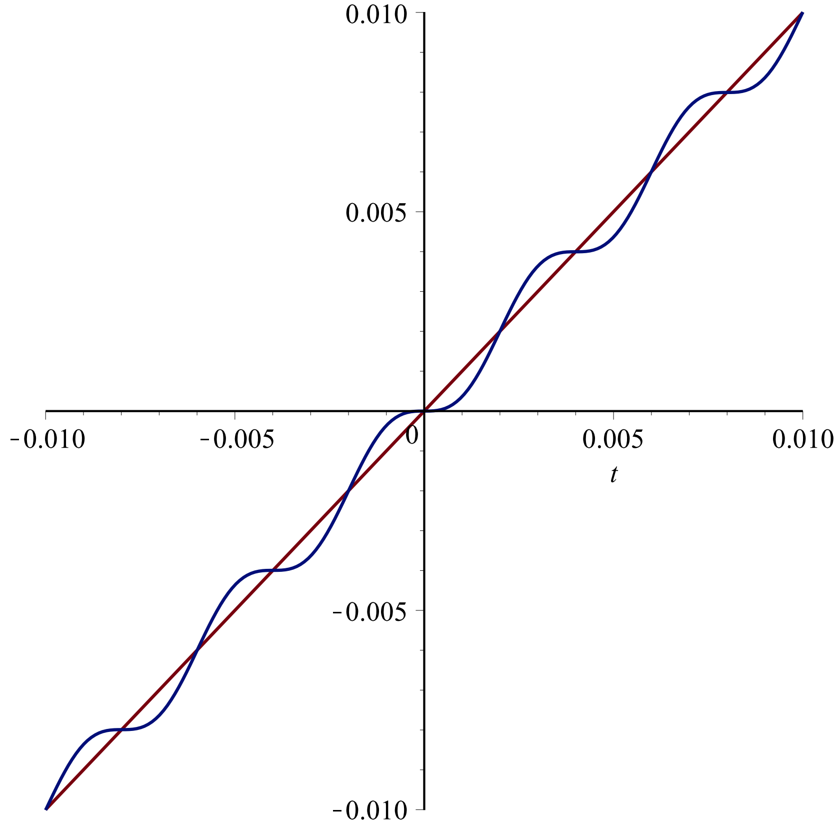
$$STFg := \sum_{n=1}^{\infty} \left(- \frac{2\ (-1)^n \sin(n\,\pi\,t)}{n\,\pi} \right) \tag{22}$$

> $STFg500 := sum\left(b[n]\cdot\sin\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right), n=1..500\right):$

> $plot(STFg500, t=-1..1)$



> $plot([g, STFg500], t=-0.01..0.01)$

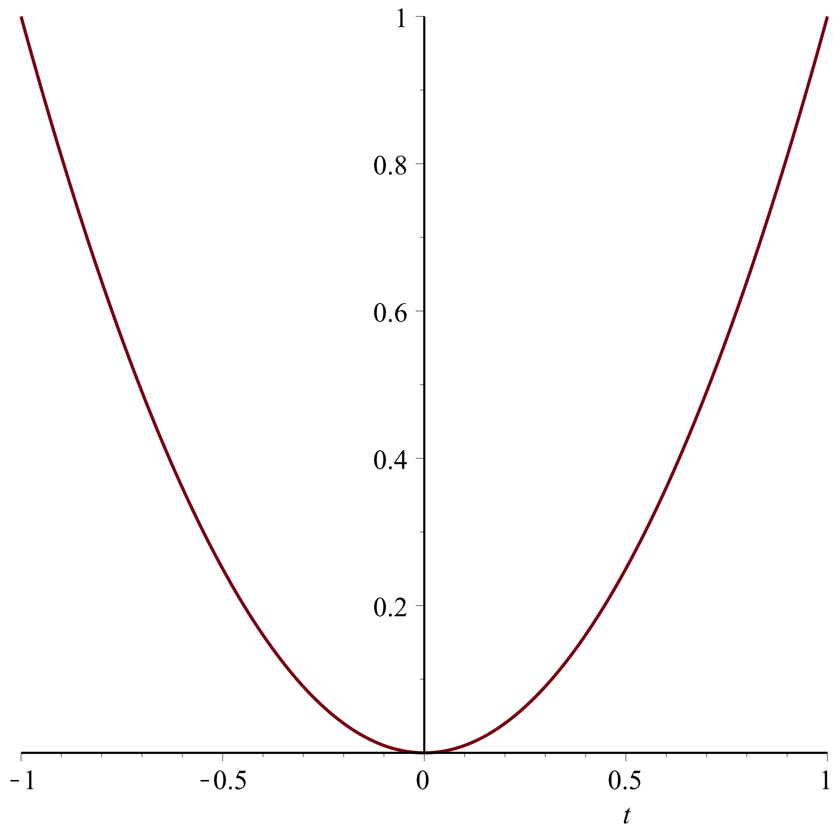


> *restart*

> $h := t^2$

$$h := t^2 \qquad (23)$$

> $plot(h, t = -1\,..1)$



> $L := 1$

$$L := 1 \tag{24}$$

> $a[0] := \frac{1}{L} \cdot int(h, t = -L..L)$

$$a_0 := \frac{2}{3} \tag{25}$$

> $C := \frac{a[0]}{2}$

$$C := \frac{1}{3} \tag{26}$$

> $a[n] := subs\left(\sin(n \cdot \mathrm{Pi}) = 0, \cos(n \cdot \mathrm{Pi}) = (-1)^n, \frac{1}{L} \cdot int\left(h \cdot \cos\left(\frac{n \cdot \mathrm{Pi}}{L} \cdot t\right), t = -L..L\right)\right)$

$$a_n := \frac{4\,(-1)^n}{n^2\,\pi^2} \tag{27}$$

> $b[n] := subs\left(\sin(n \cdot \mathrm{Pi}) = 0, \cos(n \cdot \mathrm{Pi}) = (-1)^n, \frac{1}{L} \cdot int\left(h \cdot \sin\left(\frac{n \cdot \mathrm{Pi}}{L} \cdot t\right), t = -L..L\right)\right)$

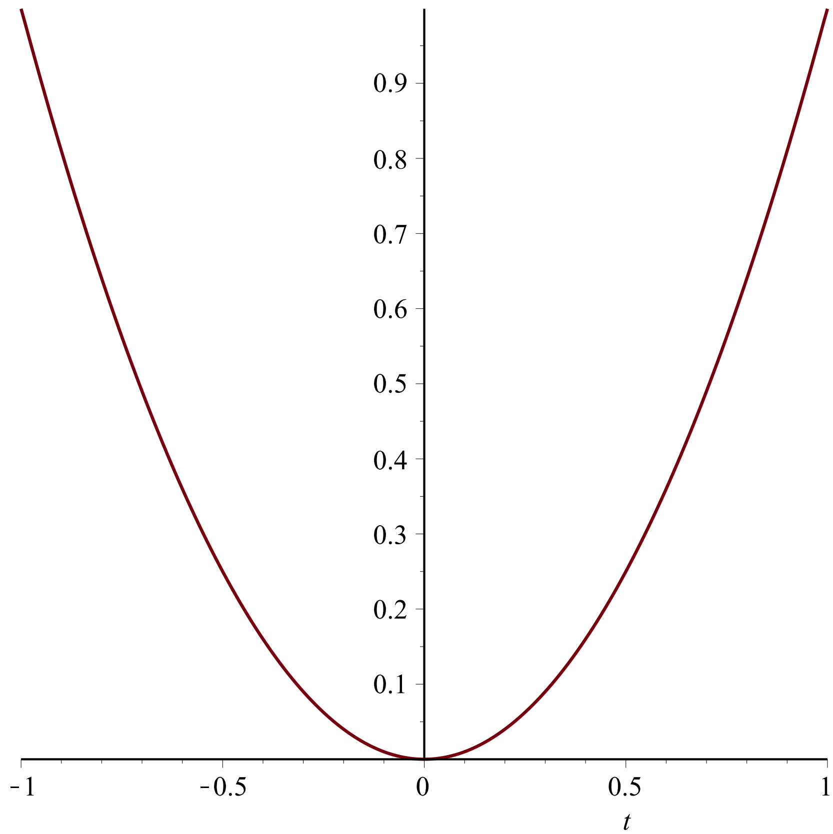
$$b_n := 0 \tag{28}$$

> $STFh := C + Sum\left(a[n]\cdot\cos\left(\frac{n\cdot \text{Pi}}{L}\cdot t\right), n = 1..infinity\right)$

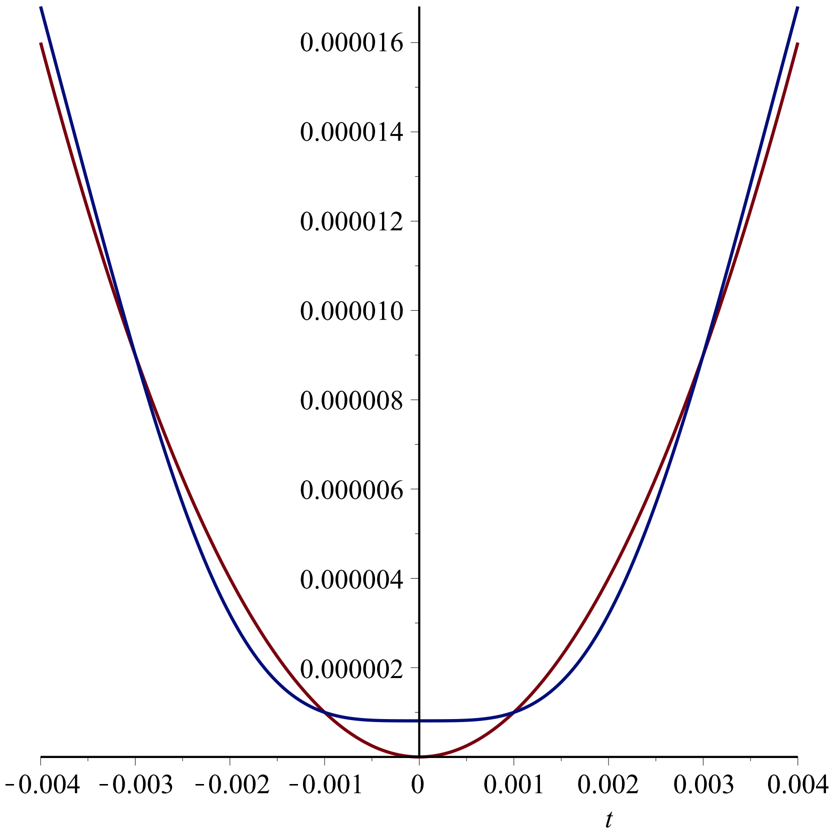
$$STFh := \frac{1}{3} + \sum_{n=1}^{\infty} \frac{4\,(-1)^n \cos(n\,\pi\,t)}{n^2\,\pi^2} \tag{29}$$

> $STFh500 := C + sum\left(a[n]\cdot\cos\left(\frac{n\cdot \text{Pi}}{L}\cdot t\right), n = 1..500\right):$

> $plot(STFh500, t = -1..1)$

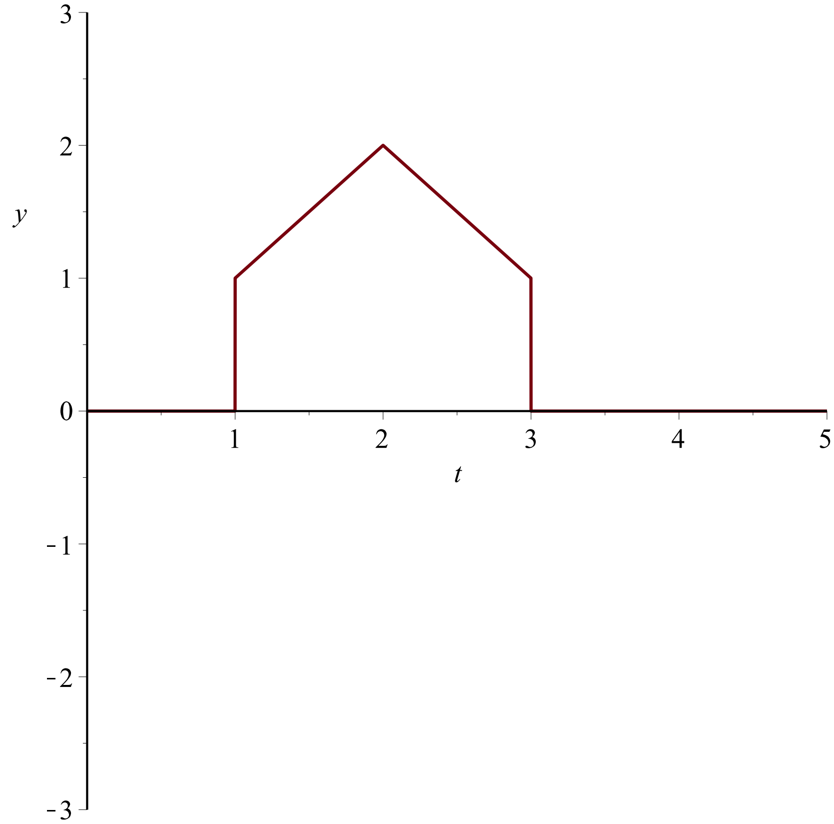


> $plot([h, STFh500], t = -0.004..0.004)$

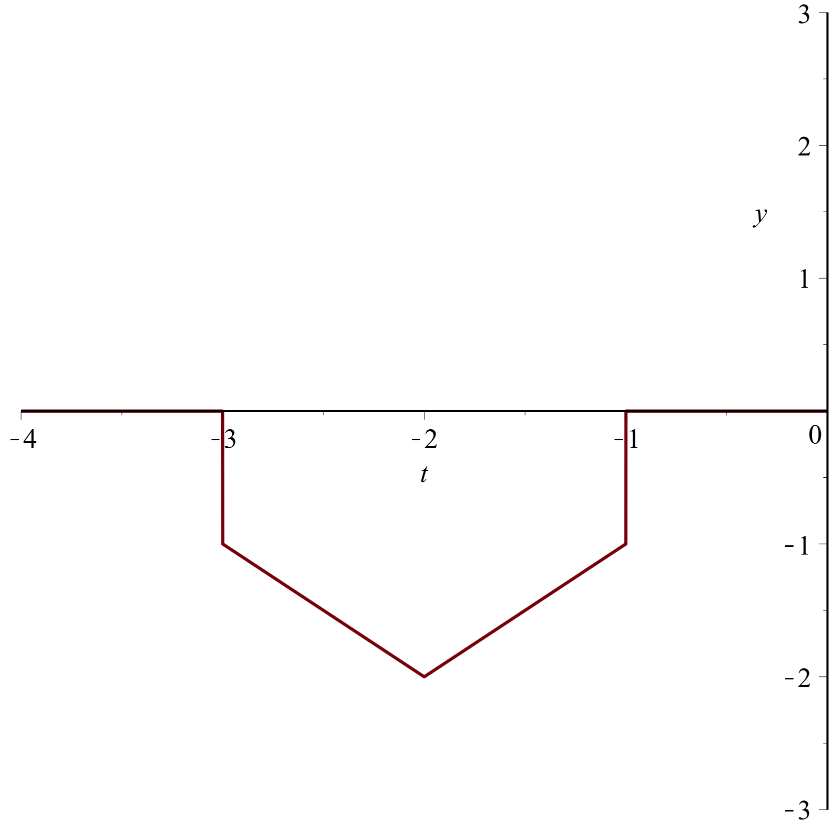


> *restart*

> $f := \mathrm{Heaviside}(t-1) + (t-1)\cdot\mathrm{Heaviside}(t-1) - 2\cdot(t-2)\cdot\mathrm{Heaviside}(t-2) + (t-3)\cdot\mathrm{Heaviside}(t-3) - \mathrm{Heaviside}(t-3) : plot(f, t=0..5, y=-3..3)$



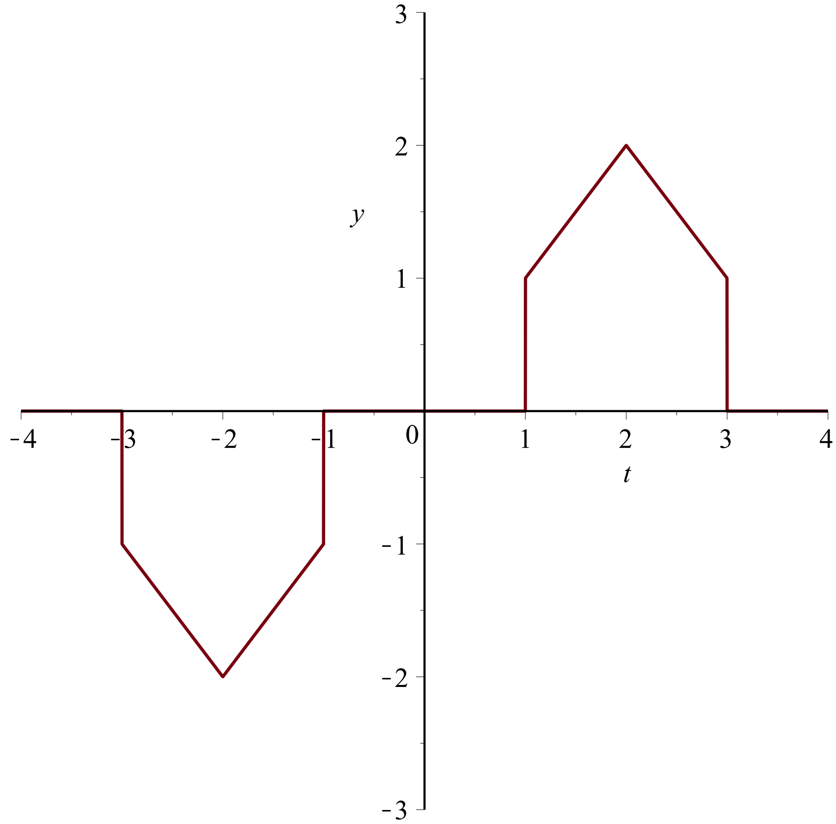
> $g := -\mathrm{Heaviside}(t+3) - (t+3)\cdot\mathrm{Heaviside}(t+3) + 2\cdot(t+2)\cdot\mathrm{Heaviside}(t+2) - (t+1)\cdot\mathrm{Heaviside}(t+1) + \mathrm{Heaviside}(t+1) : \mathit{plot}(g, t=-4..0, y=-3..3)$



> $h := f + g$

$$h := \mathrm{Heaviside}(t-1) + (t-1)\,\mathrm{Heaviside}(t-1) - 2\,(t-2)\,\mathrm{Heaviside}(t-2) + (t-3)\,\mathrm{Heaviside}(t-3) - \mathrm{Heaviside}(t-3) - \mathrm{Heaviside}(t+3) - (t+3)\,\mathrm{Heaviside}(t+3) + 2\,(t+2)\,\mathrm{Heaviside}(t+2) - (t+1)\,\mathrm{Heaviside}(t+1) + \mathrm{Heaviside}(t+1) \tag{30}$$

> $plot(h, t = -4..4, y = -3..3)$



> $L := 4$

$$L := 4 \tag{31}$$

> $b[n] := \frac{1}{L} \cdot int\left(h \cdot \sin\left(\frac{n \cdot \text{Pi}}{L} \cdot t\right), t = -L..L\right)$

$$b_n := -\frac{4\left(\sin\left(\frac{1}{4}\,n\,\pi\right) - \frac{1}{4}\,n\,\pi\cos\left(\frac{1}{4}\,n\,\pi\right)\right)}{n^2\,\pi^2} + \frac{8\left(\sin\left(\frac{1}{2}\,n\,\pi\right) - \frac{1}{2}\,n\,\pi\cos\left(\frac{1}{2}\,n\,\pi\right)\right)}{n^2\,\pi^2} - \frac{4\left(\sin\left(\frac{3}{4}\,n\,\pi\right) - \frac{3}{4}\,n\,\pi\cos\left(\frac{3}{4}\,n\,\pi\right)\right)}{n^2\,\pi^2} + \frac{4\left(-\sin\left(\frac{3}{4}\,n\,\pi\right) + \frac{3}{4}\,n\,\pi\cos\left(\frac{3}{4}\,n\,\pi\right)\right)}{n^2\,\pi^2} - \frac{8\left(-\sin\left(\frac{1}{2}\,n\,\pi\right) + \frac{1}{2}\,n\,\pi\cos\left(\frac{1}{2}\,n\,\pi\right)\right)}{n^2\,\pi^2} \tag{32}$$

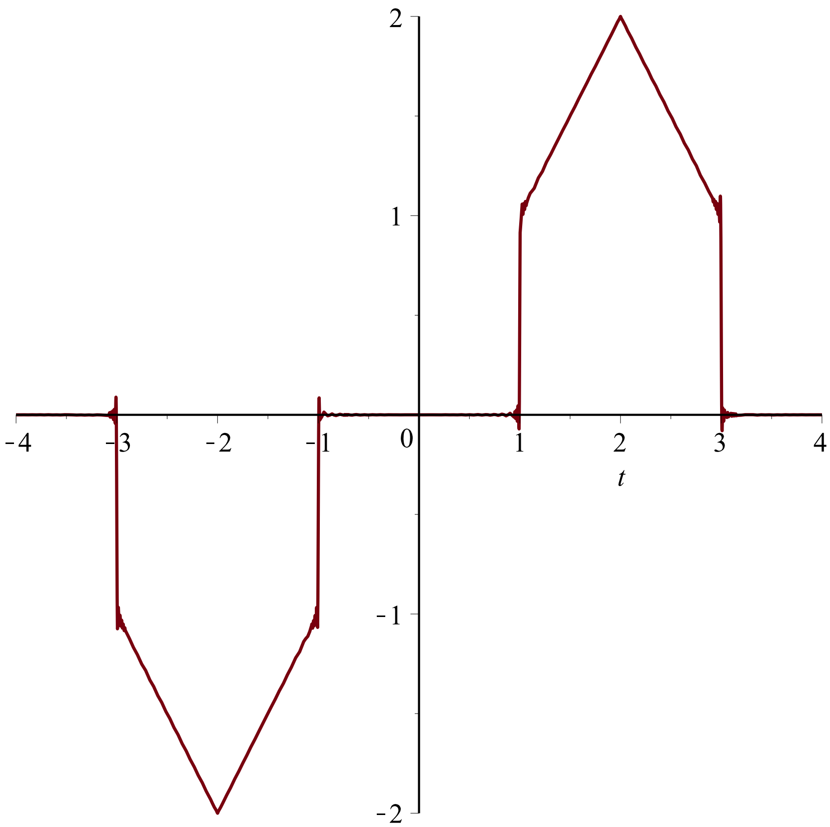
$$+\frac{4\left(-\sin\left(\frac{1}{4}n\pi\right)+\frac{1}{4}n\pi\cos\left(\frac{1}{4}n\pi\right)\right)}{n^2\pi^2}+\frac{8\cos\left(\frac{1}{2}n\pi\right)}{n\pi}-\frac{8\cos\left(\frac{3}{4}n\pi\right)}{n\pi}$$

> $STFh := Sum\left(b[n]\cdot\sin\left(\frac{n\cdot \mathrm{Pi}}{L}\cdot t\right), n=1..infinity\right)$

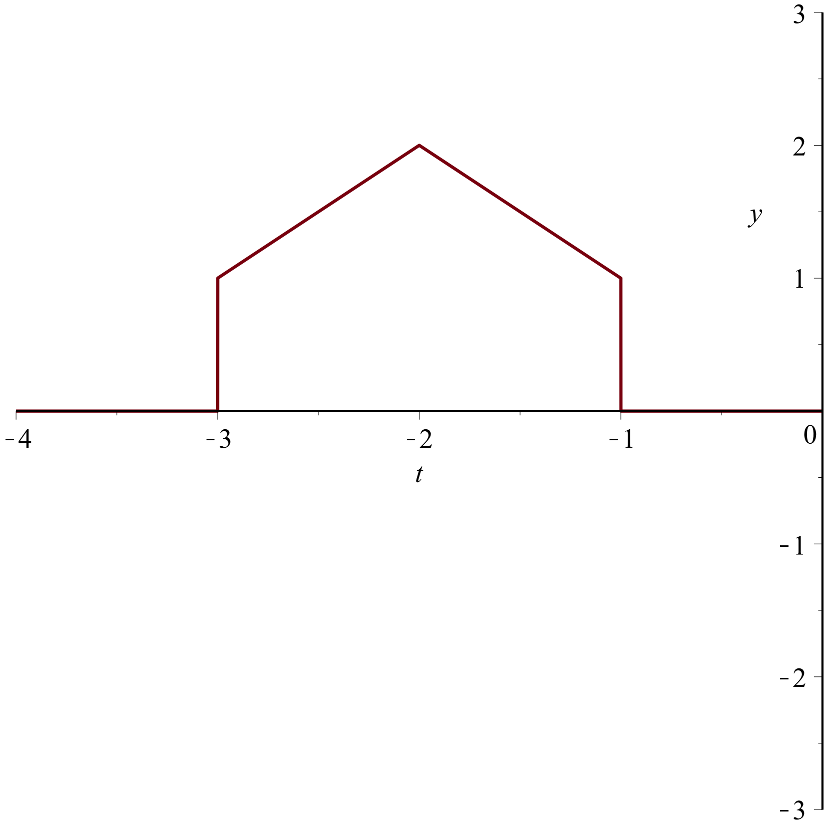
$$STFh := \sum_{n=1}^{\infty}\left(-\frac{4\left(\sin\left(\frac{1}{4}n\pi\right)-\frac{1}{4}n\pi\cos\left(\frac{1}{4}n\pi\right)\right)}{n^2\pi^2}+\frac{8\left(\sin\left(\frac{1}{2}n\pi\right)-\frac{1}{2}n\pi\cos\left(\frac{1}{2}n\pi\right)\right)}{n^2\pi^2}-\frac{4\left(\sin\left(\frac{3}{4}n\pi\right)-\frac{3}{4}n\pi\cos\left(\frac{3}{4}n\pi\right)\right)}{n^2\pi^2}+\frac{4\left(-\sin\left(\frac{3}{4}n\pi\right)+\frac{3}{4}n\pi\cos\left(\frac{3}{4}n\pi\right)\right)}{n^2\pi^2}-\frac{8\left(-\sin\left(\frac{1}{2}n\pi\right)+\frac{1}{2}n\pi\cos\left(\frac{1}{2}n\pi\right)\right)}{n^2\pi^2}+\frac{4\left(-\sin\left(\frac{1}{4}n\pi\right)+\frac{1}{4}n\pi\cos\left(\frac{1}{4}n\pi\right)\right)}{n^2\pi^2}+\frac{8\cos\left(\frac{1}{2}n\pi\right)}{n\pi}-\frac{8\cos\left(\frac{3}{4}n\pi\right)}{n\pi}\right)\sin\left(\frac{1}{4}n\pi t\right) \tag{33}$$

> $STFh500 := sum\left(b[n]\cdot\sin\left(\frac{n\cdot \mathrm{Pi}}{L}\cdot t\right), n=1..500\right):$

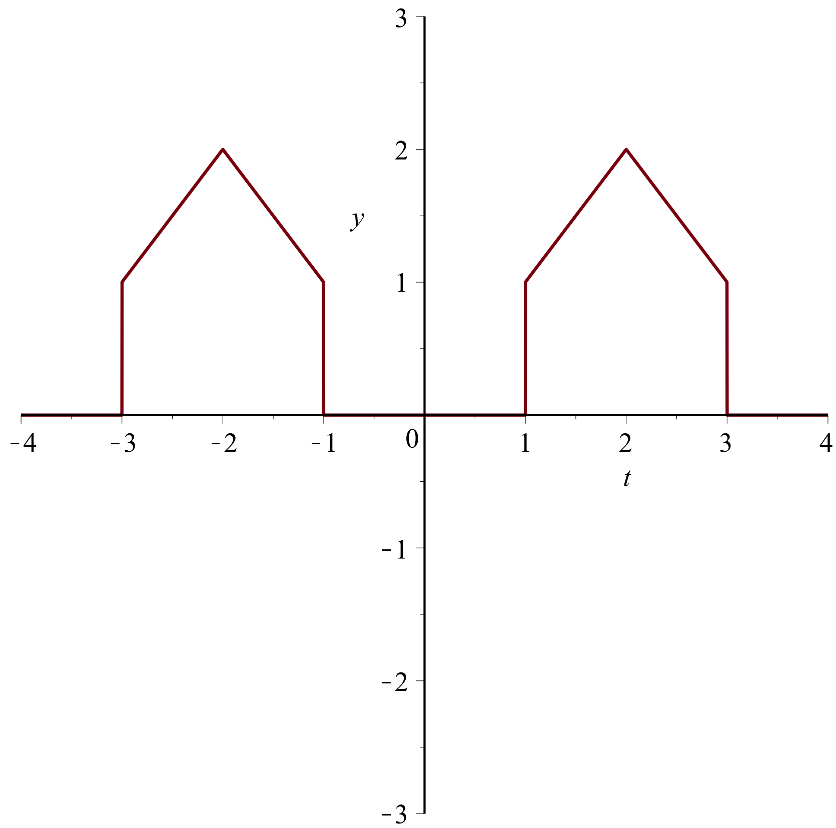
> $plot(STFh500, t=-L..L)$



$> j := \mathrm{Heaviside}(t+3) + (t+3)\cdot\mathrm{Heaviside}(t+3) - 2\cdot(t+2)\cdot\mathrm{Heaviside}(t+2) + (t+1)\cdot\mathrm{Heaviside}(t+1) - \mathrm{Heaviside}(t+1) : plot(j, t=-4..0, y=-3..3)$



$> k := j + f : plot(k, t = -4 ..4, y = -3 ..3)$



> $aa[0] := \frac{1}{L} \cdot int(k, t = -L..L)$

$$aa_0 := \frac{3}{2} \tag{34}$$

> $CC := \frac{aa[0]}{2}$

$$CC := \frac{3}{4} \tag{35}$$

> $aa[n] := \frac{1}{L} \cdot int\left(k \cdot \cos\left(\frac{n \cdot \mathrm{Pi}}{L} \cdot t\right), t = -L..L\right)$

$$aa_n := -\frac{8\left(\cos\left(\frac{3}{4} n \pi\right) + \frac{3}{4} \sin\left(\frac{3}{4} n \pi\right) n \pi\right)}{n^2 \pi^2} + \frac{16\left(\cos\left(\frac{1}{2} n \pi\right) + \frac{1}{2} \sin\left(\frac{1}{2} n \pi\right) n \pi\right)}{n^2 \pi^2} \tag{36}$$

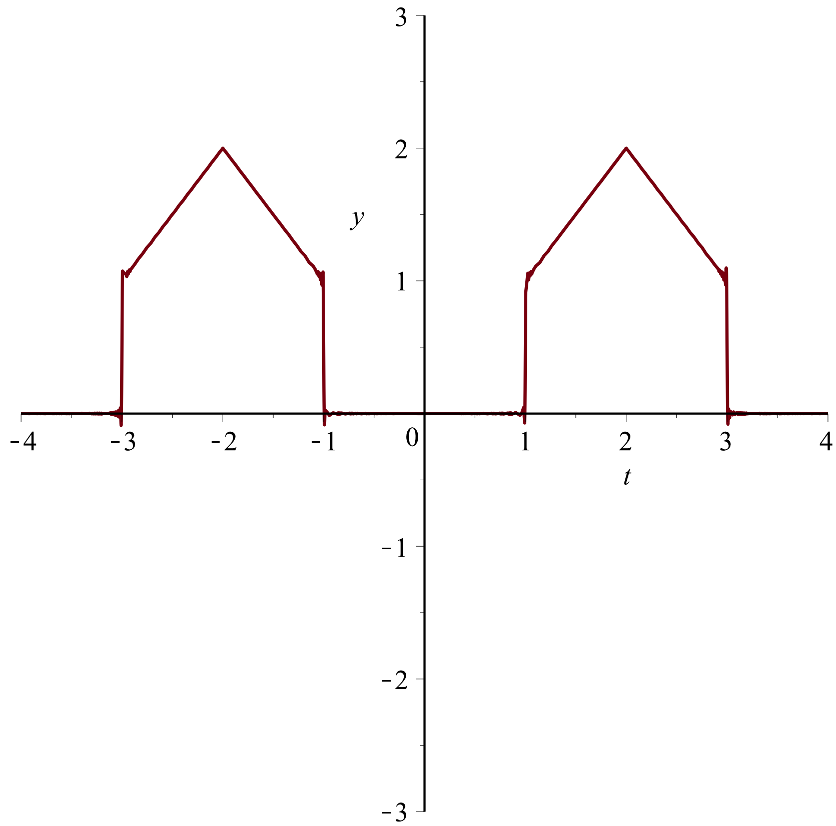
$$-\frac{8\left(\cos\left(\frac{1}{4}n\pi\right)+\frac{1}{4}\sin\left(\frac{1}{4}n\pi\right)n\pi\right)}{n^2\pi^2}+\frac{8\sin\left(\frac{3}{4}n\pi\right)}{n\pi}-\frac{8\sin\left(\frac{1}{2}n\pi\right)}{n\pi}$$

> $bb[n] := simplify\left(\frac{1}{L}\cdot int\left(k\cdot\sin\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right), t=-L..L\right)\right)$

$$bb_n := 0 \qquad \textbf{(37)}$$

> $STFk500 := CC + sum\left(aa[n]\cdot\cos\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right), n=1..500\right):$

> $plot(STFk500, t=-4..4, y=-3..3)$



>

>

>

>

>

>