> *restart*
> $f := x \cdot \cdot 2 - 5 \cdot x$

$$f := x^2 - 5\,x \tag{1}$$

> $plot(f, x = -3 ..3)$

> $L := 3$

$$L := 3 \tag{2}$$

> $a_0 := \left(\dfrac{1}{L} \right) \cdot int(f, x = -L..L)$

$$a_0 := 6 \tag{3}$$

> $c := \dfrac{a_0}{2}$

$$c := 3 \tag{4}$$

> $a_n := subs\left(\sin(n \cdot \mathrm{Pi}) = 0, \cos(n \cdot \mathrm{Pi}) = (-1) \cdot \cdot n, \left(\dfrac{1}{L} \right) \cdot int\left(f \cdot \cos\left(\dfrac{n \cdot \mathrm{Pi} \cdot x}{L} \right), x = -L..L \right) \right)$

$$a_n := \dfrac{36\,(-1)^n}{n^2\,\pi^2} \tag{5}$$

> $b_n := subs\left(\sin(n \cdot Pi) = 0, \cos(n \cdot Pi) = (-1) \cdot \cdot n, \left(\dfrac{1}{L}\right) \cdot int\left(f \cdot \sin\left(\dfrac{n \cdot Pi \cdot x}{L}\right), x = -L..L\right)\right)$

$$b_n := \frac{30 \, (-1)^n}{n \, \pi} \tag{6}$$

> $STFf := c + Sum\left(a_n \cdot \cos\left(\dfrac{n \cdot Pi \cdot x}{L}\right) + b_n \cdot \sin\left(\dfrac{n \cdot Pi \cdot x}{L}\right), n = 1 .. infinity\right)$

$$STFf := 3 + \sum_{n=1}^{\infty} \left(\frac{36 \, (-1)^n \cos\left(\dfrac{1}{3} \, n \, \pi \, x\right)}{n^2 \, \pi^2} + \frac{30 \, (-1)^n \sin\left(\dfrac{1}{3} \, n \, \pi \, x\right)}{n \, \pi} \right) \tag{7}$$

> $STF_{10000} := c + sum\left(a_n \cdot \cos\left(\dfrac{n \cdot Pi \cdot x}{L}\right) + b_n \cdot \sin\left(\dfrac{n \cdot Pi \cdot x}{L}\right), n = 1 .. 10000\right) :$

> $plot\left([f + 1, STF_{10000}], x = -2.9 .. 2.9\right)$
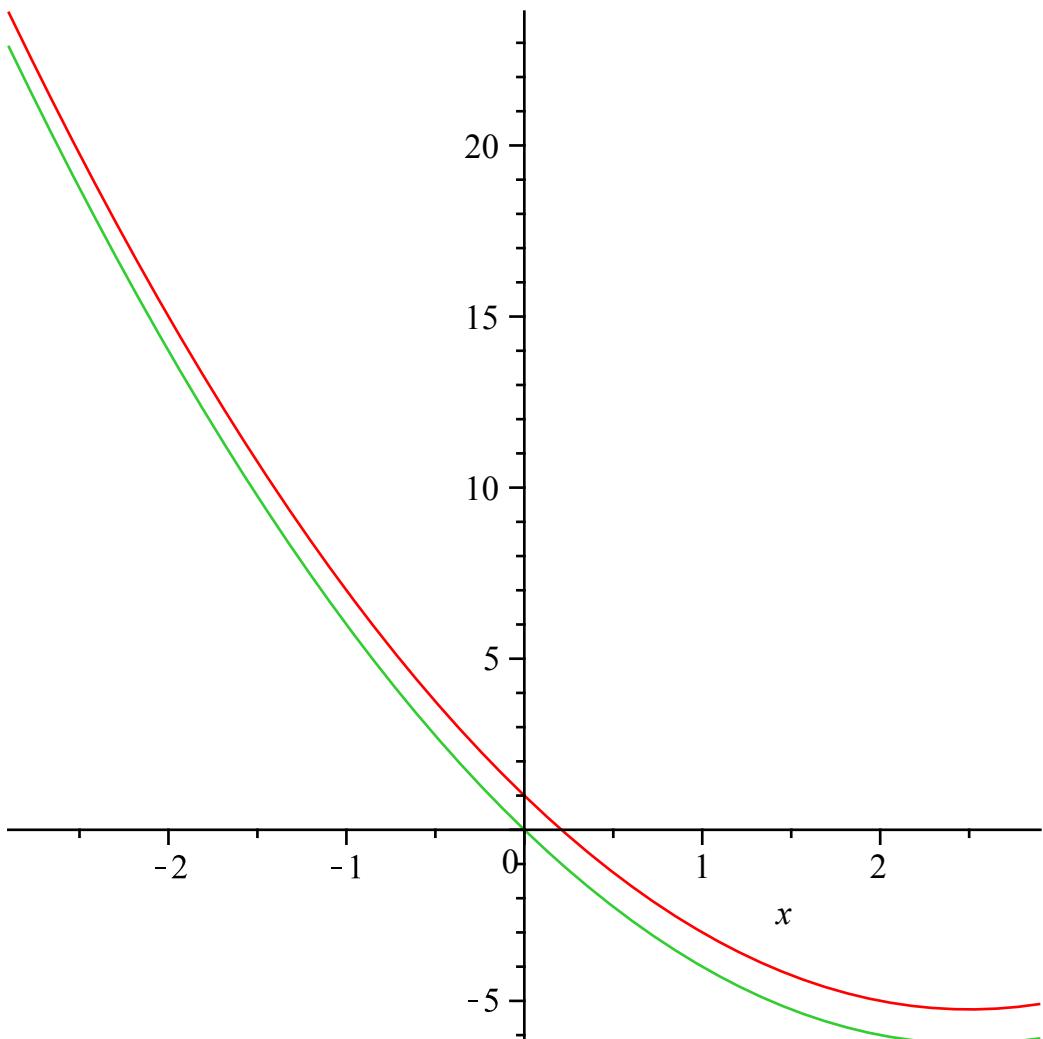
> $plot\left([f, STF_{10000}], x = -0.0005 .. 0.0005\right)$

The graph shows a red line and green curve intersecting near the origin, with x-axis labeled from -0.0004 to 0.0004 and y-axis from -0.002 to 0.002.
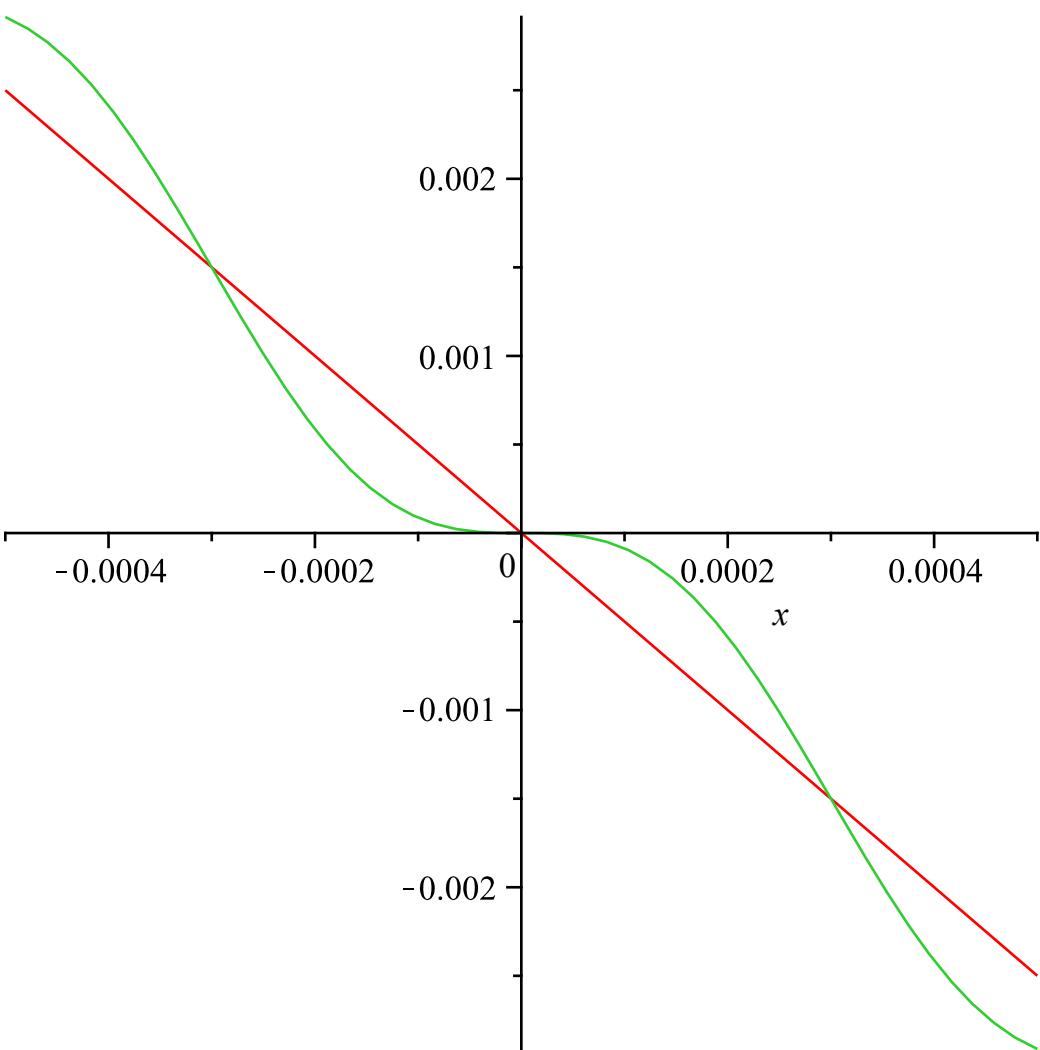
> *restart*

> $f := \exp(2 \cdot x)$

$$f := e^{2x} \tag{8}$$

> $L := 1$

$$L := 1 \tag{9}$$

> $a_0 := \left(\dfrac{1}{L}\right) \cdot int(f, x = -L..L)$

$$a_0 := -\frac{1}{2} e^{-2} + \frac{1}{2} e^2 \tag{10}$$

> $c := \dfrac{a_0}{2}$

$$c := -\frac{1}{4} e^{-2} + \frac{1}{4} e^2 \tag{11}$$

> $a_n := subs\left(\sin(n \cdot \mathrm{Pi}) = 0, \cos(n \cdot \mathrm{Pi}) = (-1) \cdot \cdot n, \left(\dfrac{1}{L}\right) \cdot int\left(f \cdot \cos\left(\dfrac{n \cdot \mathrm{Pi} \cdot x}{L}\right), x = -L..L\right)\right)$

$$a_n := \frac{-2 e^{-2} (-1)^n + 2 e^2 (-1)^n}{4 + n^2 \pi^2} \tag{12}$$

> $b_n := subs\left(\sin(n \cdot Pi) = 0, \cos(n \cdot Pi) = (-1) \cdot \cdot n, \left(\dfrac{1}{L} \right) \cdot int\left(f \cdot \sin\left(\dfrac{n \cdot Pi \cdot x}{L} \right), x = -L..L \right) \right)$

$$b_n := \frac{e^{-2}\, n\, \pi\, (-1)^n - e^2\, n\, \pi\, (-1)^n}{4 + n^2\, \pi^2} \tag{13}$$

> $STF := c + Sum\left(a_n \cdot \cos\left(\dfrac{n \cdot Pi \cdot x}{L} \right) + b_n \cdot \sin\left(\dfrac{n \cdot Pi \cdot x}{L} \right), n = 1..infinity \right)$

$$STF := -\frac{1}{4}\, e^{-2} + \frac{1}{4}\, e^2 + \sum_{n=1}^{\infty} \left(\frac{\left(-2\, e^{-2}\, (-1)^n + 2\, e^2\, (-1)^n \right) \cos(n\, \pi\, x)}{4 + n^2\, \pi^2} \right.$$
$$\left. + \frac{\left(e^{-2}\, n\, \pi\, (-1)^n - e^2\, n\, \pi\, (-1)^n \right) \sin(n\, \pi\, x)}{4 + n^2\, \pi^2} \right) \tag{14}$$

> $STF_{1000} := c + sum\left(a_n \cdot \cos\left(\dfrac{n \cdot Pi \cdot x}{L} \right) + b_n \cdot \sin\left(\dfrac{n \cdot Pi \cdot x}{L} \right), n = 1..1000 \right) :$

> $plot\left([\, f + 1, STF_{1000}\,], x = -0.99..0.99 \right)$
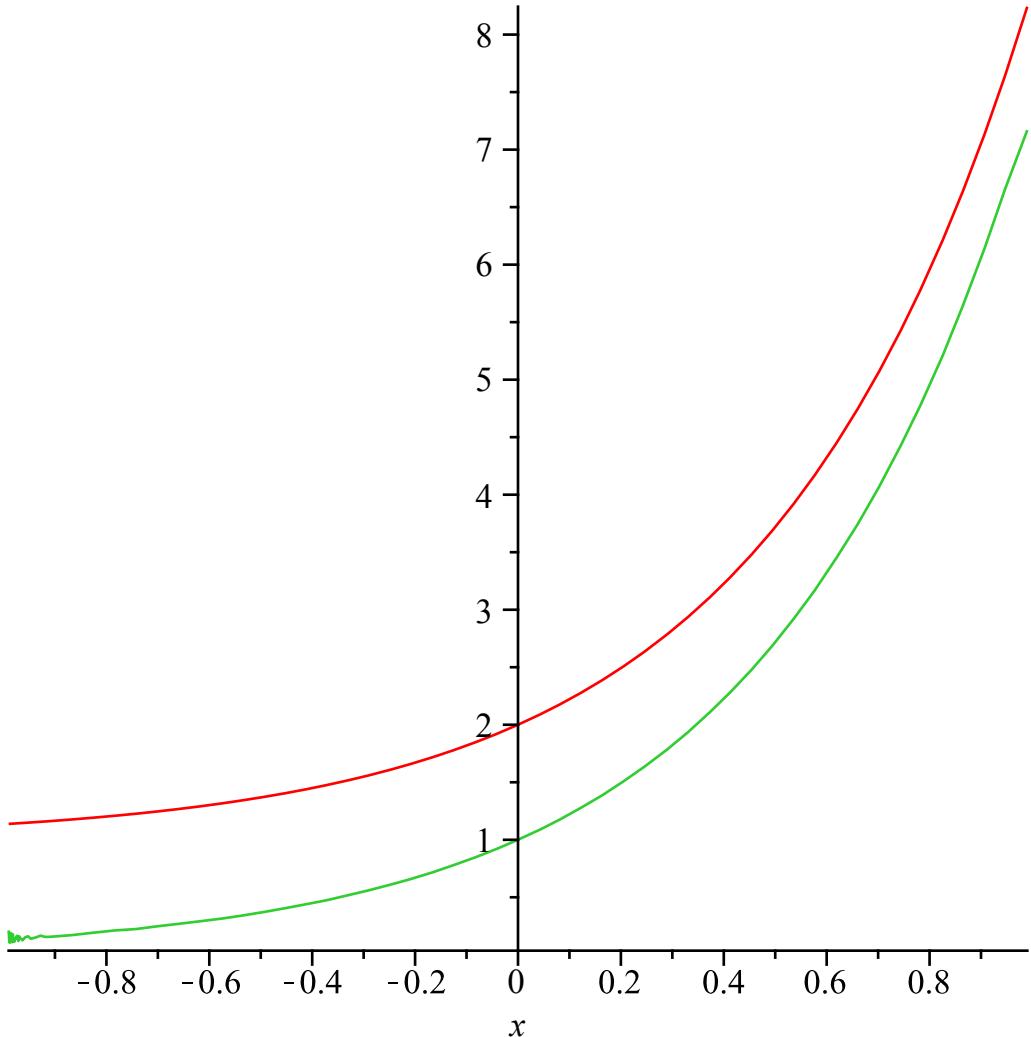
> $plot\left([\, f, STF_{1000}\,], x = -0.39..-0.41 \right)$

>
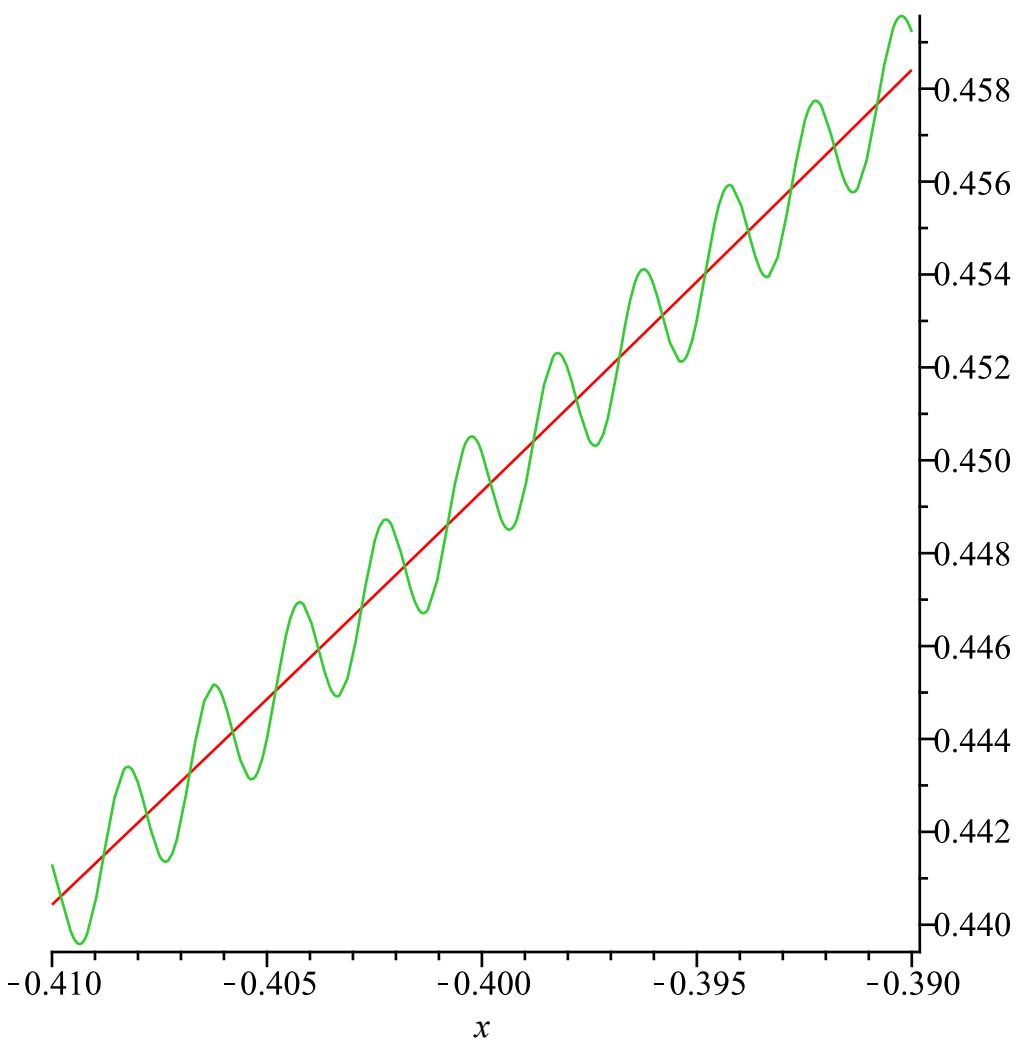
$$g = -3\,u(t+3) - (t+3)\cdot u(t+3) + \ (t+4)\,u(t+4) +$$
$$+ 8\,u(t) + (t-2)\,u(t-2) - (t-3)\,u(t-3) - 4\,u(t-3)$$

> $g := -3 \cdot \text{Heaviside}(t+3) - (t+3) \cdot \text{Heaviside}(t+3) + (t+2) \cdot \text{Heaviside}(t+2) + 8$
  $\cdot \text{Heaviside}(t) - (t-2) \cdot \text{Heaviside}(t-2) + (t-3) \cdot \text{Heaviside}(t-3) - 3 \cdot \text{Heaviside}(t$
  $-3) : plot(g, t = -4 \mathbin{..} 4)$
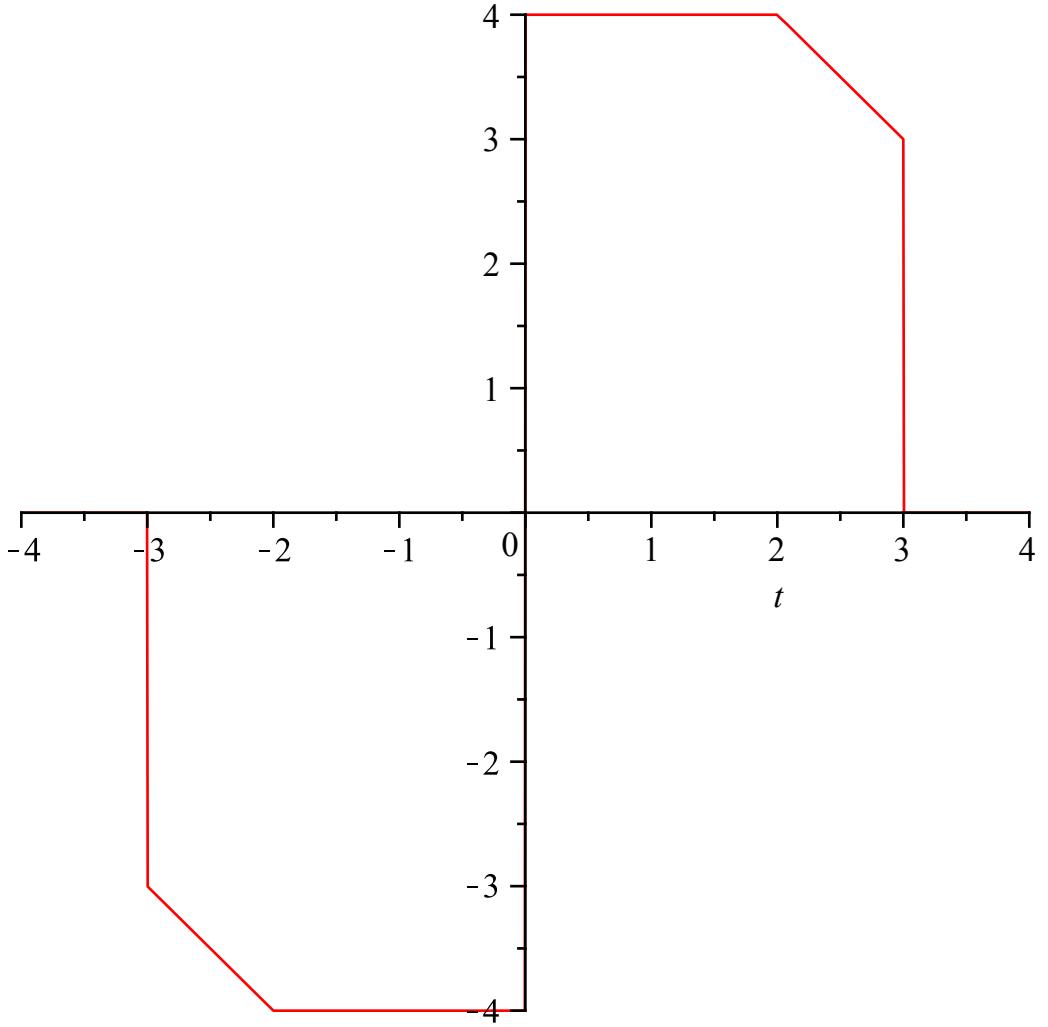
> $L := 4; a_0 := \left(\dfrac{1}{L}\right) \cdot int(g, t = -L..L); c := \dfrac{a_0}{2}$

$$L := 4$$
$$a_0 := 0$$
$$c := 0$$

(15)

> $a_n := \left(\dfrac{1}{L}\right) \cdot int\left(g \cdot \cos\left(\dfrac{n \cdot Pi \cdot t}{L}\right), t = -L..L\right)$

$$a_n := 0$$

(16)

> $b_n := \left(\dfrac{1}{L}\right) \cdot int\left(g \cdot \sin\left(\dfrac{n \cdot Pi \cdot t}{L}\right), t = -L..L\right)$

$$b_n := -\frac{12\cos\left(\dfrac{3}{4} n \pi\right)}{n \pi} + \frac{4\left(-\sin\left(\dfrac{3}{4} n \pi\right) + \dfrac{3}{4}\cos\left(\dfrac{3}{4} n \pi\right) n \pi\right)}{n^2 \pi^2}$$

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

(17)

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

> $STF := Sum\left(b_n \cdot \sin\left(\frac{n \cdot Pi \cdot t}{L}\right), n = 1 .. infinity\right)$

$$STF := \sum_{n=1}^{\infty}\left(-\frac{12\cos\left(\frac{3}{4}\,n\,\pi\right)}{n\,\pi} + \frac{4\left(-\sin\left(\frac{3}{4}\,n\,\pi\right) + \frac{3}{4}\cos\left(\frac{3}{4}\,n\,\pi\right)n\,\pi\right)}{n^2\,\pi^2}\right. \tag{18}$$

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

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

$$\left. - \frac{4\left(\sin\left(\frac{3}{4}\,n\,\pi\right) - \frac{3}{4}\cos\left(\frac{3}{4}\,n\,\pi\right)n\,\pi\right)}{n^2\,\pi^2}\right)\sin\left(\frac{1}{4}\,n\,\pi\,t\right)$$

> $STF_{1000} := sum\left(b_n \cdot \sin\left(\frac{n \cdot Pi \cdot t}{L}\right), n = 1 .. 1000\right) :$

> $plot\left(\left[g + 0.1, STF_{1000}\right], t = -L .. L\right)$