> *restart*

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

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

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

> $L := 1$

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

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

$$A_0 := -\frac{5}{2}\, e^{-2} + \frac{5}{2}\, e^{2}$$

$$18.135 \tag{3}$$

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

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

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

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

> $STFfuncion := \dfrac{A[0]}{2} + sum\left(\left(A[n]\cdot\cos\left(\dfrac{n\cdot\text{Pi}}{L}\cdot x\right) + B[n]\cdot\sin\left(\dfrac{n\cdot\text{Pi}}{L}\cdot x\right)\right), n = 1\,..\,infinity\right)$

$$STFfuncion := -\frac{5}{4}\,e^{-2} + \frac{5}{4}\,e^{2} - \frac{1}{\pi^2 + 4}\left(5\,e^2\left(\text{hypergeom}\left(\left[1, \frac{\pi - 2\,I}{\pi}, \frac{\pi + 2\,I}{\pi}\right],\right.\right.\right. \tag{6}$$

$$\left.\left[\frac{2\,(\pi - I)}{\pi}, \frac{2\,(\pi + I)}{\pi}\right], -e^{I\pi x}\right) e^{I\pi x} + e^{-I\pi x}\,\text{hypergeom}\left(\left[1, \frac{\pi - 2\,I}{\pi}, \frac{\pi + 2\,I}{\pi}\right],\right.$$

$$\left.\left[\frac{2\,(\pi - I)}{\pi}, \frac{2\,(\pi + I)}{\pi}\right], -e^{-I\pi x}\right)\right) + \frac{1}{\pi^2 + 4}\left(5\,e^{-2}\left(\text{hypergeom}\left(\left[1, \frac{\pi - 2\,I}{\pi},\right.\right.\right.\right.$$

$$\left.\frac{\pi + 2\,I}{\pi}\right], \left[\frac{2\,(\pi - I)}{\pi}, \frac{2\,(\pi + I)}{\pi}\right], -e^{I\pi x}\right) e^{I\pi x} + e^{-I\pi x}\,\text{hypergeom}\left(\left[1, \frac{\pi - 2\,I}{\pi},\right.\right.$$

$$\left.\left.\frac{\pi + 2\,I}{\pi}\right], \left[\frac{2\,(\pi - I)}{\pi}, \frac{2\,(\pi + I)}{\pi}\right], -e^{-I\pi x}\right)\right)$$

$$+ \frac{1}{\pi^2 + 4}\left(\frac{5}{2}\,I\,\pi\,e^2\left(\text{hypergeom}\left(\left[2, \frac{\pi - 2\,I}{\pi}, \frac{\pi + 2\,I}{\pi}\right], \left[\frac{2\,(\pi - I)}{\pi}, \frac{2\,(\pi + I)}{\pi}\right],\right.\right.\right.$$

$$\left.-e^{-I\pi x}\right) e^{-I\pi x} - e^{I\pi x}\,\text{hypergeom}\left(\left[2, \frac{\pi - 2\,I}{\pi}, \frac{\pi + 2\,I}{\pi}\right], \left[\frac{2\,(\pi - I)}{\pi}, \frac{2\,(\pi + I)}{\pi}\right],\right.$$

$$\left.\left.-e^{I\pi x}\right)\right)\right) + \frac{1}{\pi^2 + 4}\left(\frac{5}{2}\,I\,\pi\,e^{-2}\left(e^{I\pi x}\,\text{hypergeom}\left(\left[2, \frac{\pi - 2\,I}{\pi}, \frac{\pi + 2\,I}{\pi}\right],\right.\right.\right.$$

$$\left.\left[\frac{2\,(\pi - I)}{\pi}, \frac{2\,(\pi + I)}{\pi}\right], -e^{I\pi x}\right) - \text{hypergeom}\left(\left[2, \frac{\pi - 2\,I}{\pi}, \frac{\pi + 2\,I}{\pi}\right], \left[\frac{2\,(\pi - I)}{\pi},\right.\right.$$

$$\left.\left.\left.\frac{2\,(\pi + I)}{\pi}\right], -e^{-I\pi x}\right) e^{-I\pi x}\right)\right)$$

> $STF500 := \dfrac{A[0]}{2} + sum\left(\left(A[n]\cdot\cos\left(\dfrac{n\cdot\text{Pi}}{L}\cdot x\right) + B[n]\cdot\sin\left(\dfrac{n\cdot\text{Pi}}{L}\cdot x\right)\right), n = 1\,..\,500\right):$

> $plot(STF500, x = -L\,..L)$
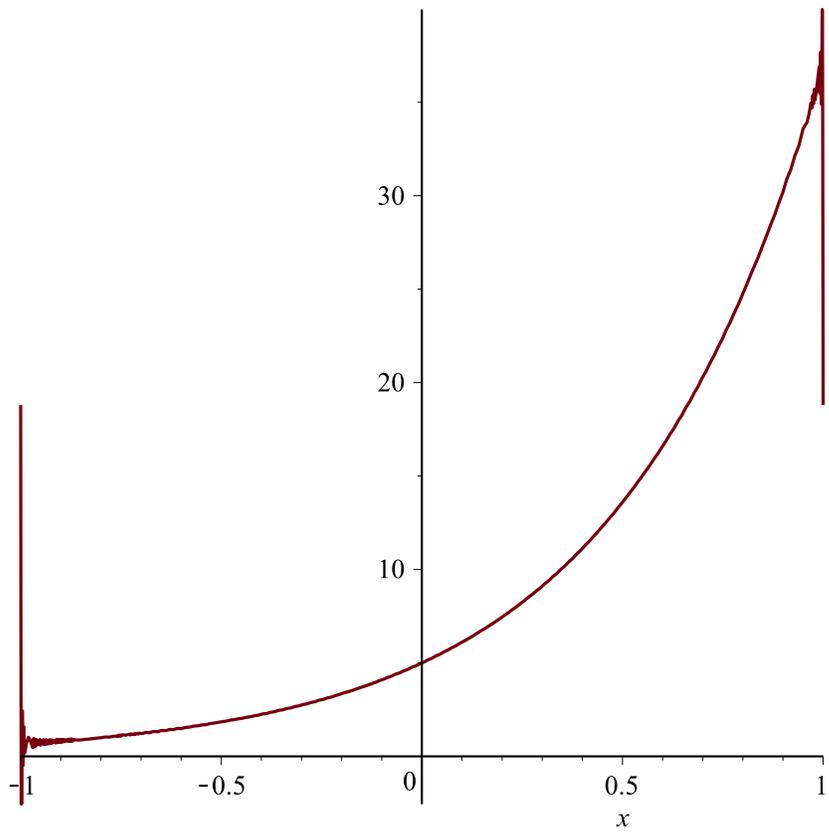
$> plot(\{f, STF500\}, x = -0.99 .. 0.99)$
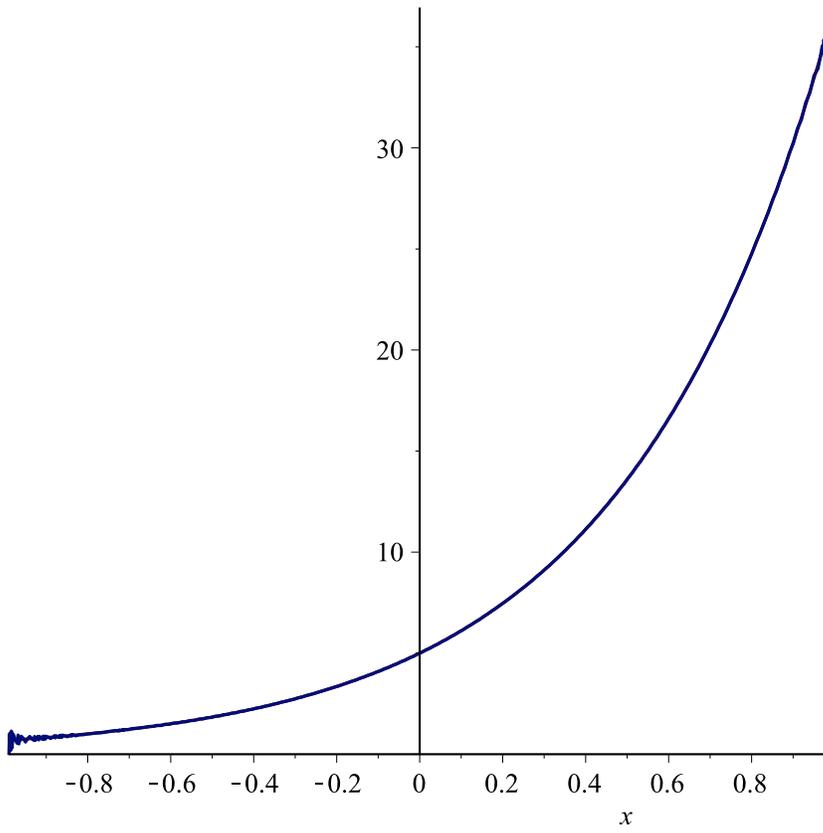
$$> plot(\{f, STF500\}, x = -0.01 ..0.01)$$

x
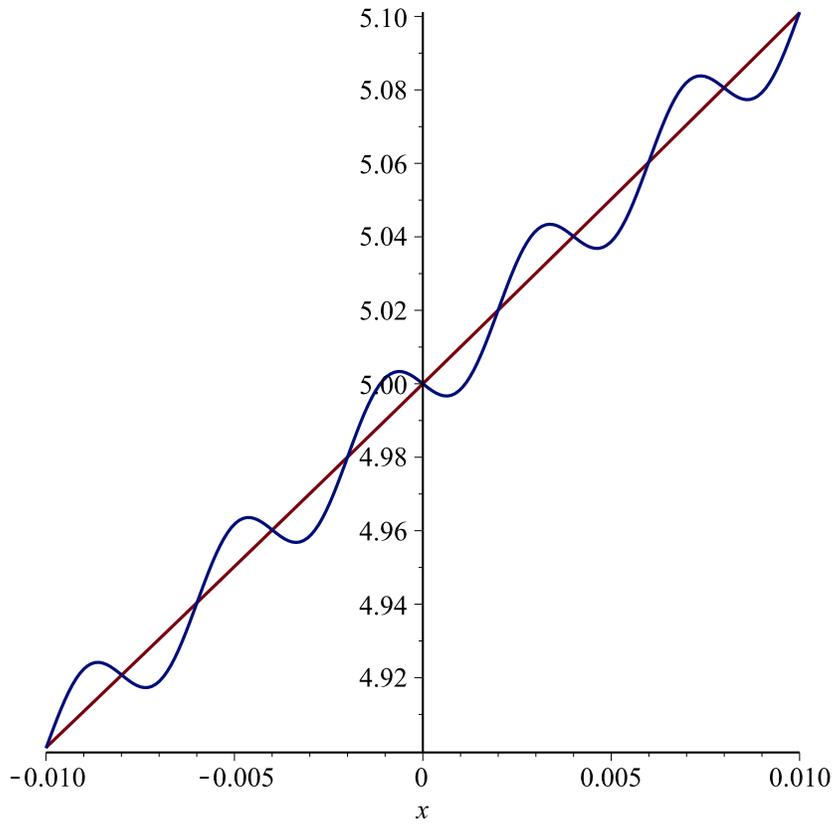
> *restart*

> $g := x^3 - 3 \cdot x^2 + 2 \cdot x - 4$

$$g := x^3 - 3\,x^2 + 2\,x - 4 \qquad\qquad\textbf{(7)}$$

> $plot(g, x = -5 .. 5)$
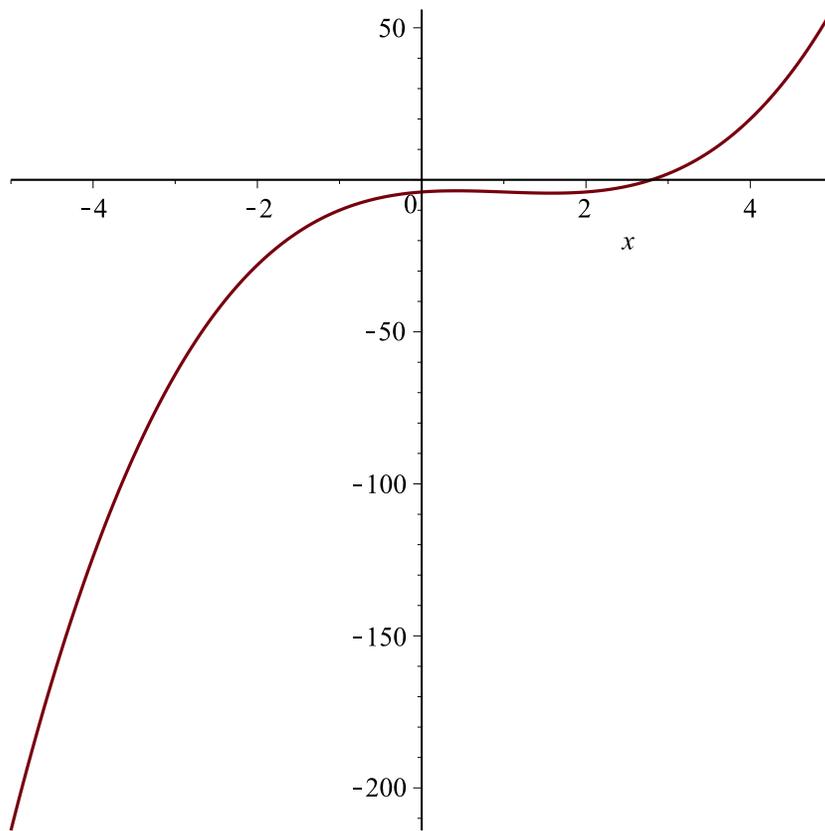
> $L := 5$

$$L := 5 \tag{8}$$

> $A[0] := \dfrac{1}{L} \cdot int(g, x = -L..L)$

$$A_0 := -58 \tag{9}$$

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

$$A_n := -\frac{300\,(-1)^n}{n^2\,\pi^2} \tag{10}$$

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

$$B_n := \frac{10\left(-27\,(-1)^n\,\pi^3\,n^3 + 150\,(-1)^n\,\pi\,n \right)}{n^4\,\pi^4} \tag{11}$$

> $STF1000 := \dfrac{A[0]}{2} + sum\left(\left(A[n] \cdot \cos\left(\dfrac{n \cdot \mathrm{Pi}}{L} \cdot x \right) + B[n] \cdot \sin\left(\dfrac{n \cdot \mathrm{Pi}}{L} \cdot x \right) \right), n = 1..1000 \right) :$

> $plot(STF1000, x = -L..L)$
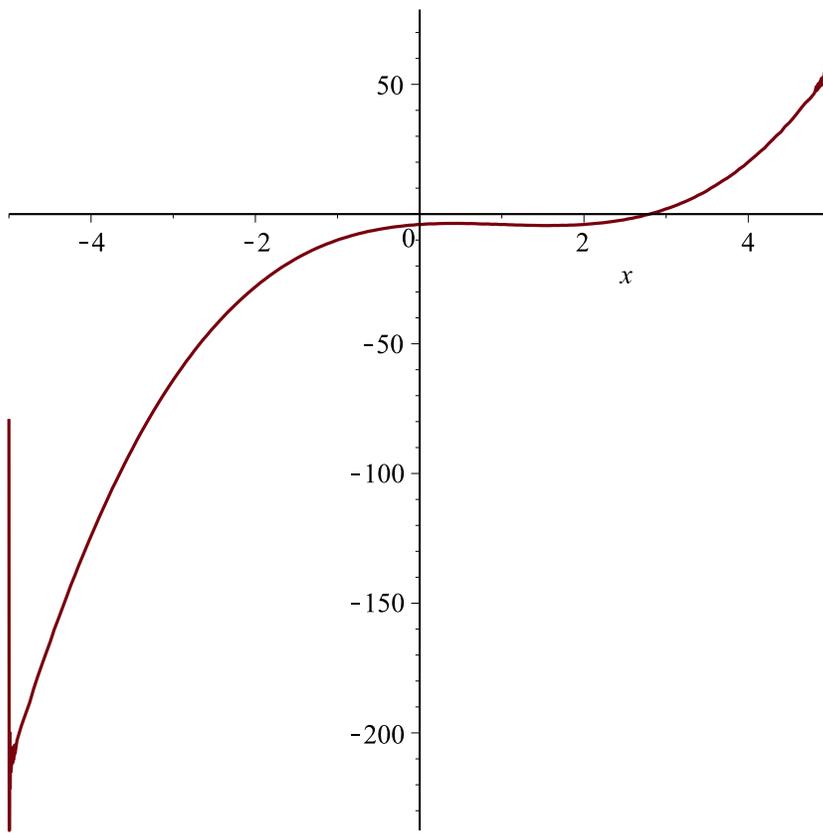
> $plot(g, x = -L .. L)$
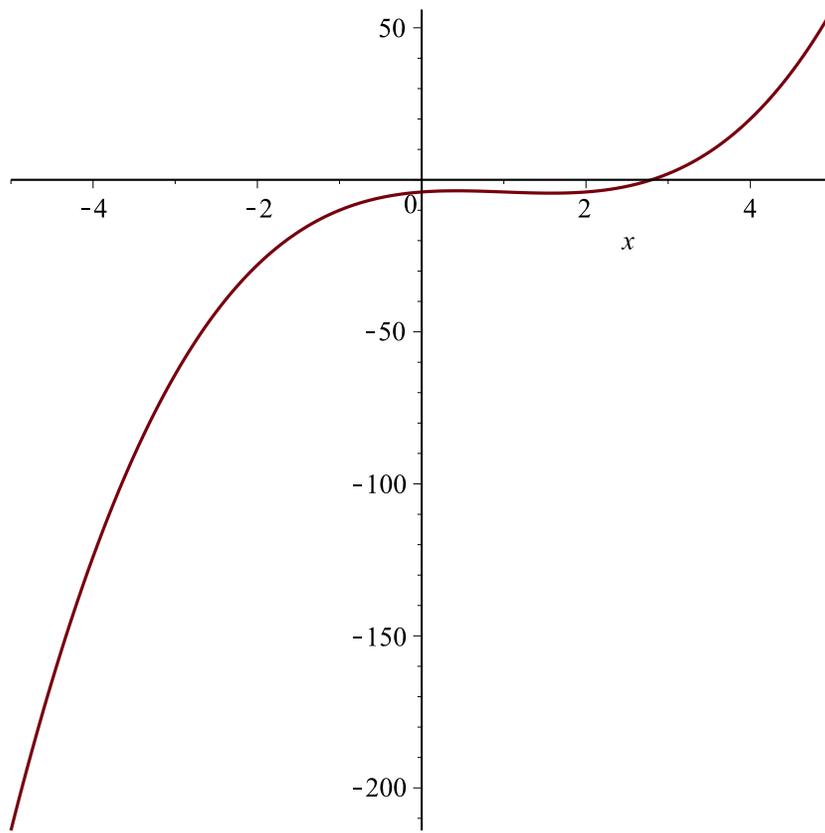
> $plot(\{g, STF1000\}, x = 2.75 .. 2.85)$

> restart

> $g := x^3$

$$g := x^3 \tag{12}$$
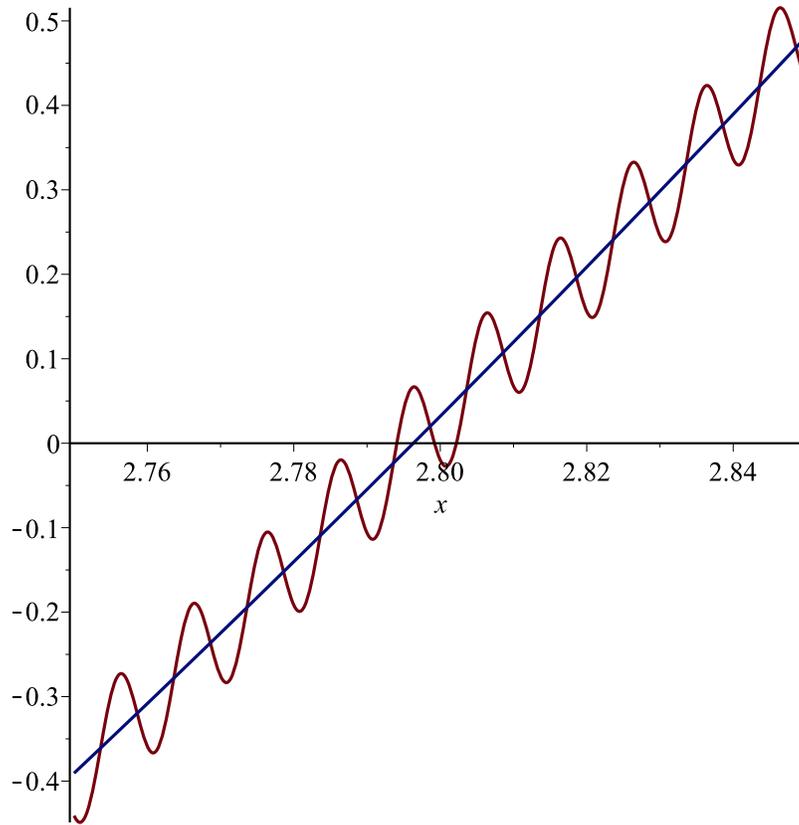
> $plot(g, x = -1 .. 1)$
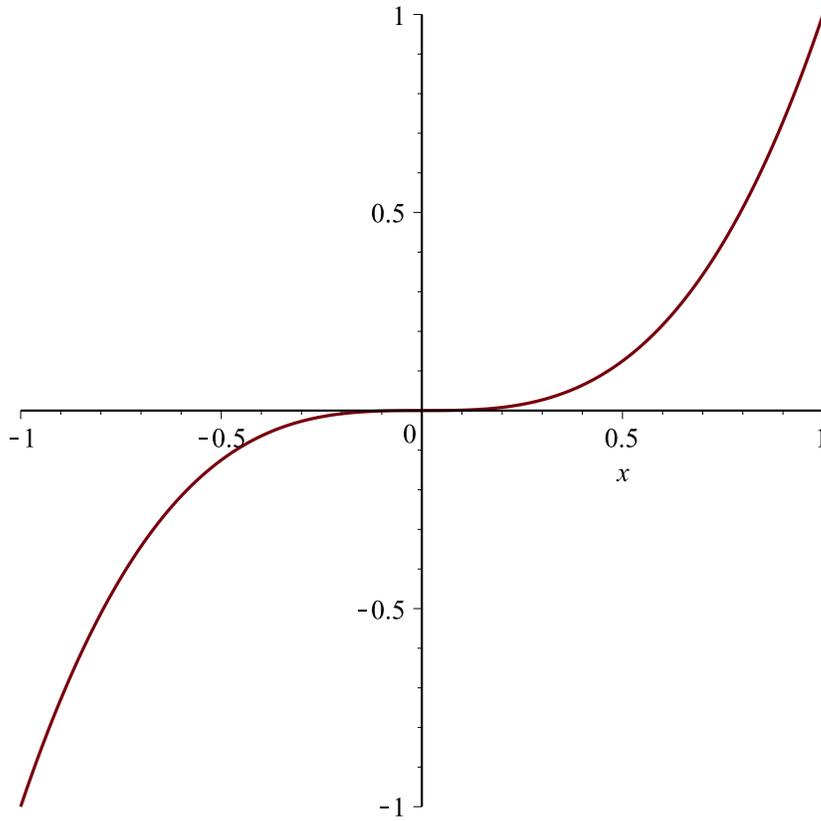
> $L := 1$

$$L := 1 \tag{13}$$

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

$$a_0 := 0 \tag{14}$$

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

$$a_n := 0 \tag{15}$$

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

$$b_n := -\dfrac{2\left((-1)^n \pi^3 n^3 - 6(-1)^n \pi n\right)}{n^4 \pi^4} \tag{16}$$

> $STF500 := sum\left(b[n] \cdot \sin\left(\dfrac{n \cdot \pi}{L} \cdot x\right), n = 1..500\right) :$

> $plot(STF500, x = -L..L)$
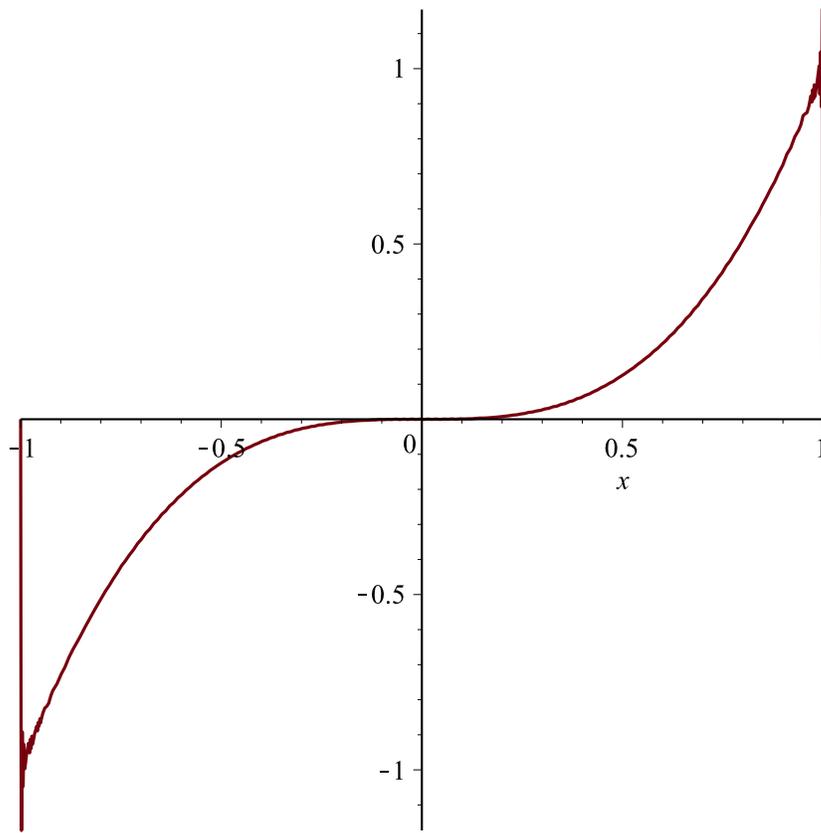
> restart
> $h := \mathrm{abs}(x)$

$$h := |x|$$　　　　　　　　　　　　　　　　　　**(17)**

> $plot(h, x = -2 .. 2)$
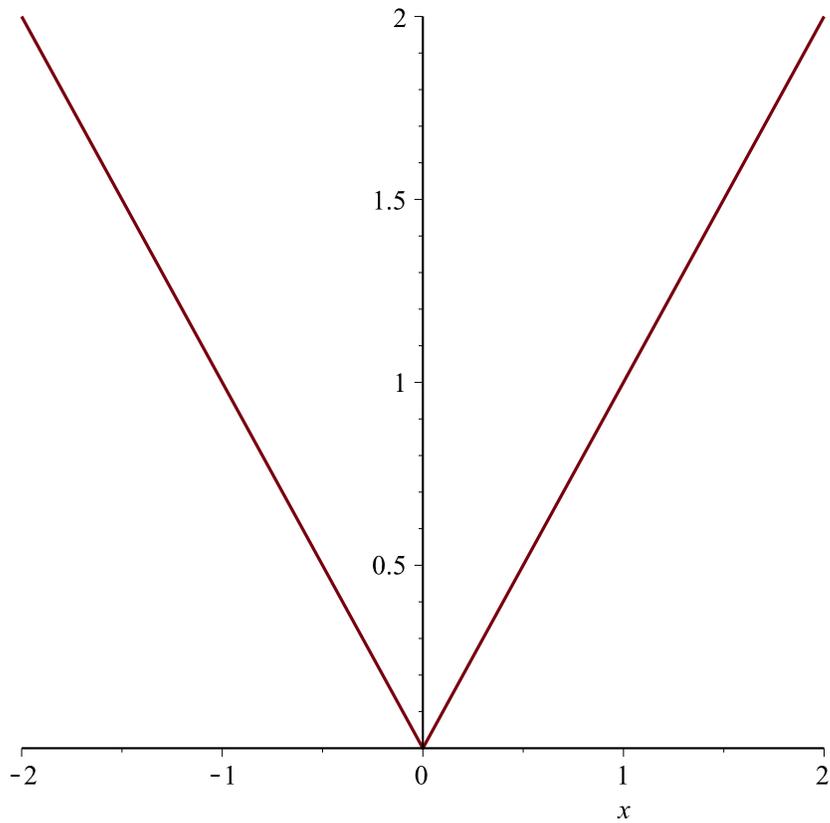
> $L := 2$

$$L := 2 \tag{18}$$

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

$$a_0 := 2 \tag{19}$$

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

$$a_n := \dfrac{4\left(-1 + (-1)^n\right)}{n^2 \, \pi^2} \tag{20}$$

> $STF500 := \dfrac{a[0]}{2} + sum\left(a[n] \cdot \cos\left(\dfrac{n \cdot \mathrm{Pi}}{L} \cdot x \right), n = 1..500 \right) :$
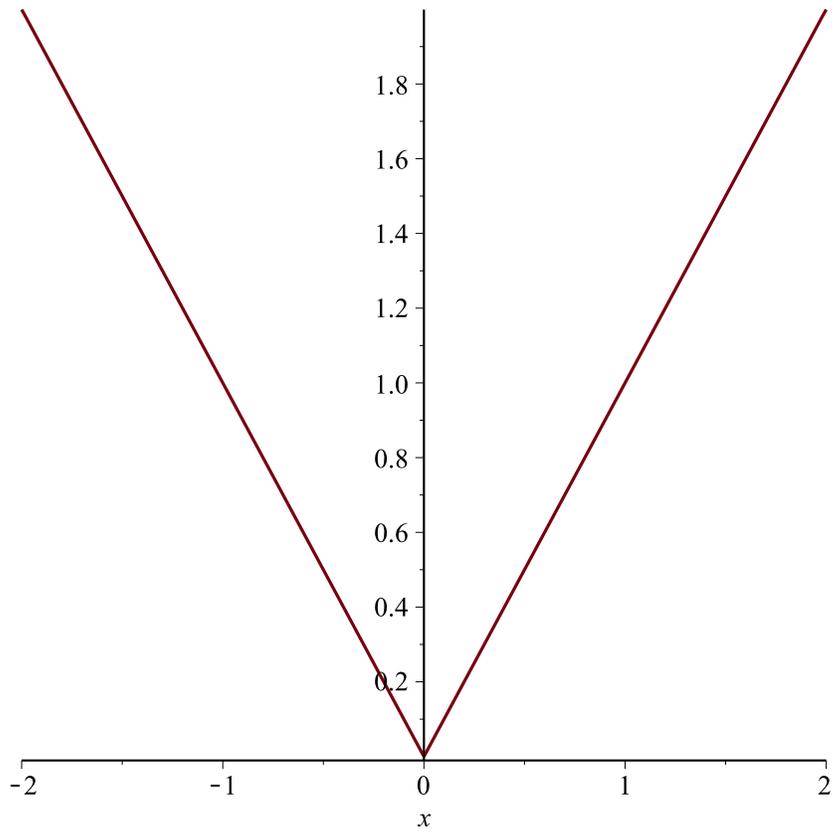
> $plot(STF500, x = -L..L)$

> restart

> $j := -\text{Heaviside}(t+2) + 2 \cdot \text{Heaviside}(t) - \text{Heaviside}(t-2) : plot(j, t=-3 ..3)$
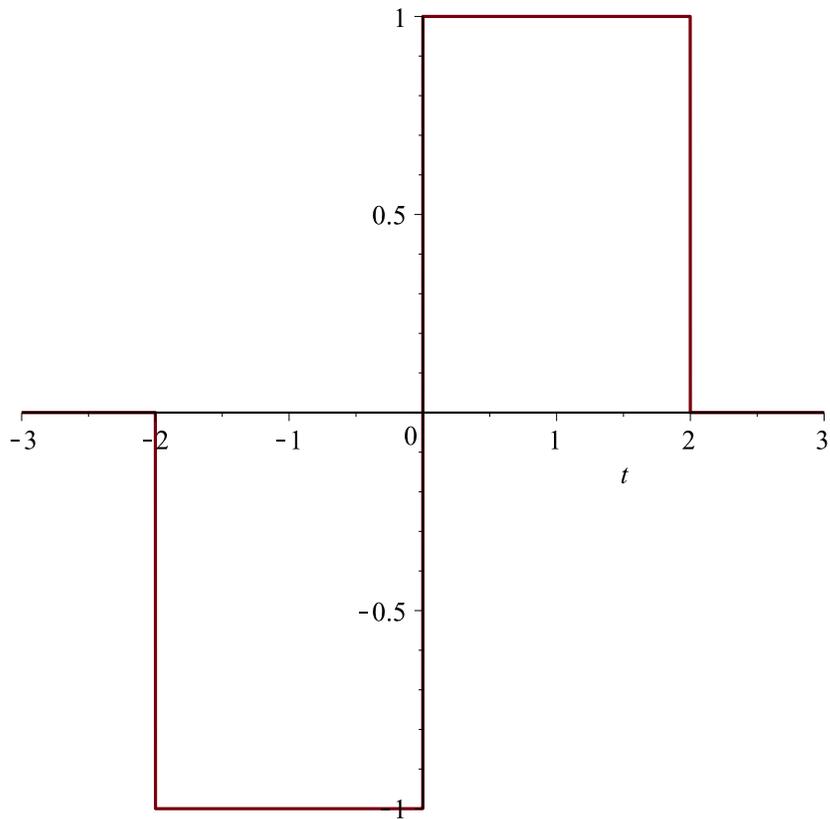
> $L := 3$

$$L := 3 \tag{21}$$

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

$$b_n := -\frac{2 \cos\left(\dfrac{2}{3}\, n\, \pi \right)}{n\, \pi} + \frac{2}{n\, \pi} \tag{22}$$

> $STF500 := sum\left(b[n] \cdot \sin\left(\dfrac{n \cdot \mathrm{Pi}}{L} \cdot t \right), n = 1..500 \right):$

> $plot(STF500, t = -3..3)$