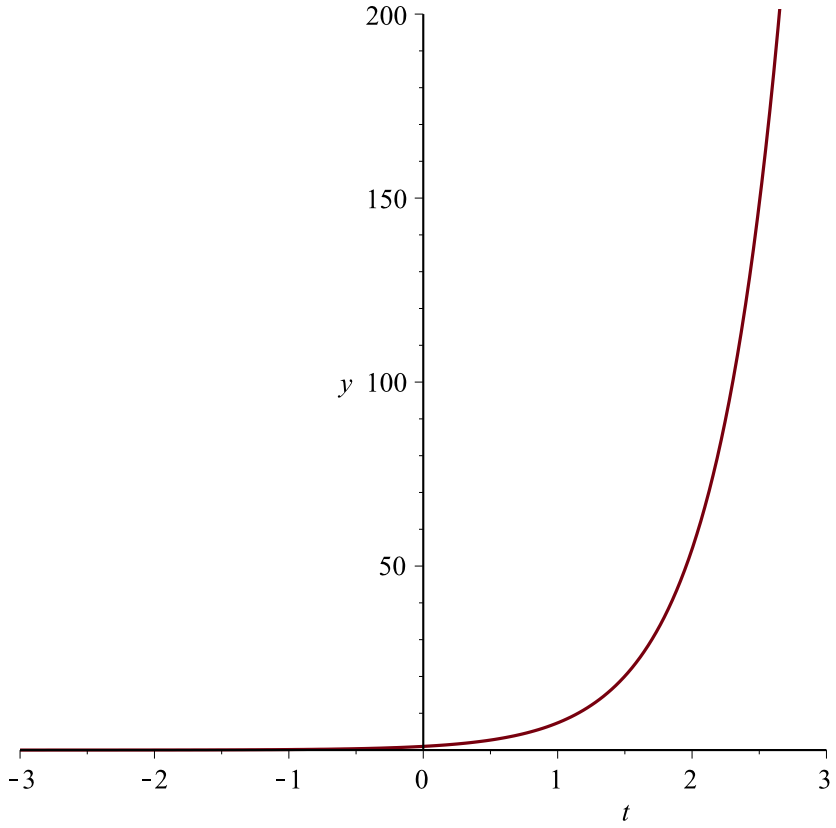
```
> restart
> f := exp(2·t)
```

$$f := e^{2t} \tag{1}$$

```
> plot(f, t = -3..3, y = 0..200)
```




```
> L := 3
```

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

```
> a[0] := 1/L·int(f, t = -L..L) : evalf(%)
```

$$67.23771913 \tag{3}$$

```
> a[n] := subs(sin(n·Pi) = 0, cos(n·Pi) = (-1)^n, 1/L·int(f·cos(n·Pi/L·t), t = -L..L))
```

$$a_n := \frac{6\,e^{6}\,(-1)^{n} - 6\,e^{-6}\,(-1)^{n}}{\pi^{2}\,n^{2} + 36} \tag{4}$$

```
> b[n] := subs(sin(n·Pi) = 0, cos(n·Pi) = (-1)^n, 1/L·int(f·sin(n·Pi/L·t), t = -L..L))
```

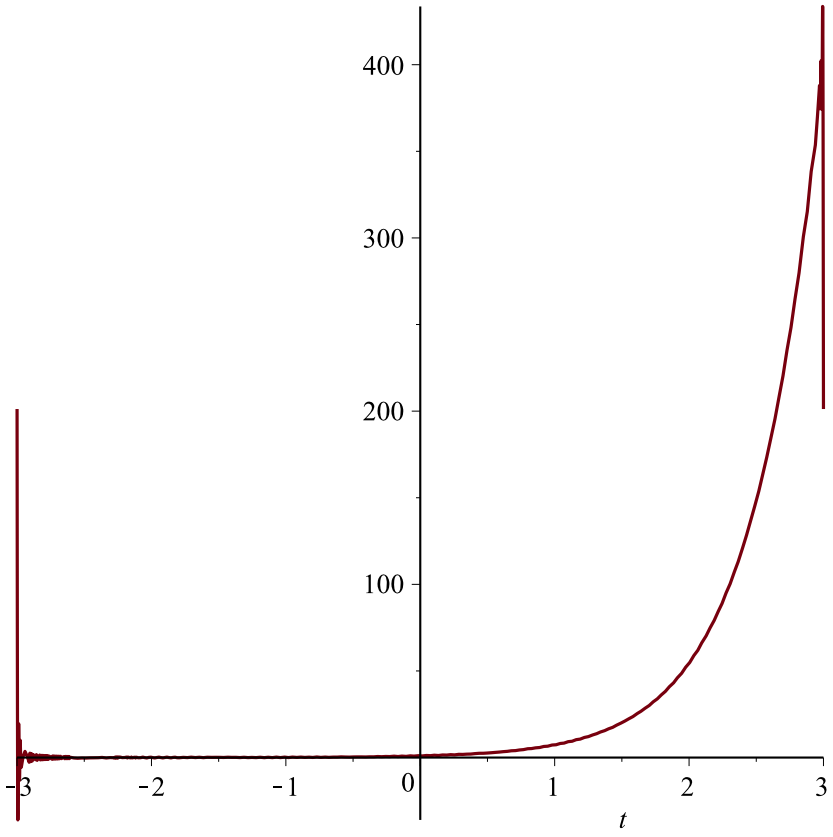
$$b_n := -\frac{e^{6}\,(-1)^{n}\,\pi\,n - e^{-6}\,(-1)^{n}\,\pi\,n}{\pi^{2}\,n^{2} + 36} \tag{5}$$

> $STF := \frac{a[0]}{2} + Sum\left(a[n]\cdot\cos\left(\frac{n\cdot \mathrm{Pi}}{L}\cdot t\right) + b[n]\cdot\sin\left(\frac{n\cdot \mathrm{Pi}}{L}\cdot t\right), n = 1..infinity\right)$

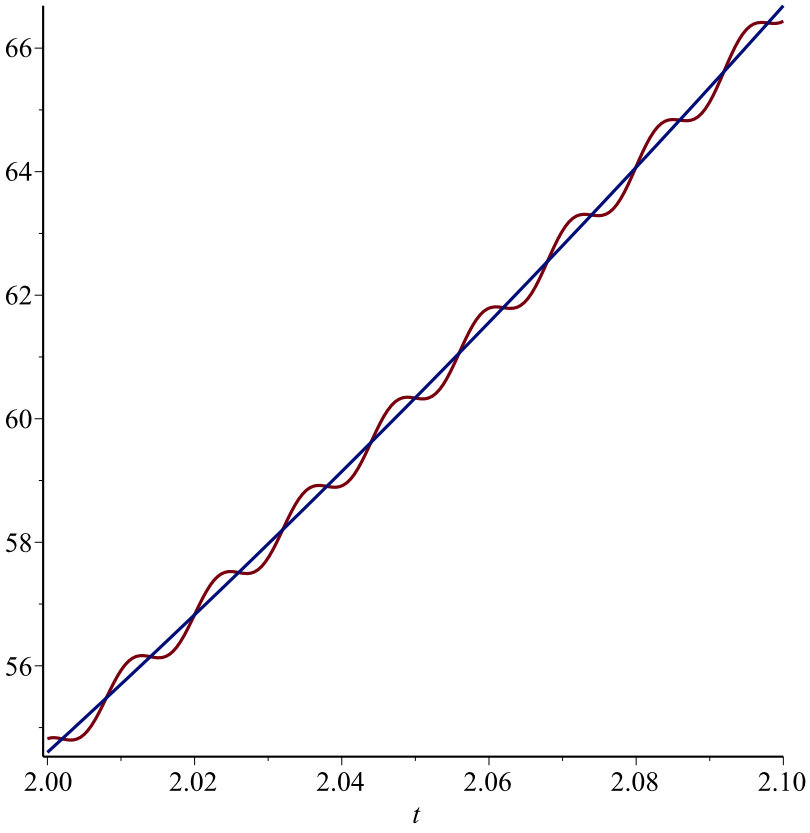
$$STF := -\frac{1}{12}\,e^{-6} + \frac{1}{12}\,e^{6} + \sum_{n=1}^{\infty}\left(\frac{\left(6\,e^{6}\,(-1)^{n} - 6\,e^{-6}\,(-1)^{n}\right)\cos\left(\frac{1}{3}\,n\,\pi\,t\right)}{\pi^{2}\,n^{2} + 36} - \frac{\left(e^{6}\,(-1)^{n}\,\pi\,n - e^{-6}\,(-1)^{n}\,\pi\,n\right)\sin\left(\frac{1}{3}\,n\,\pi\,t\right)}{\pi^{2}\,n^{2} + 36}\right) \tag{6}$$

> $STF500 := \frac{a[0]}{2} + sum\left(a[n]\cdot\cos\left(\frac{n\cdot \mathrm{Pi}}{L}\cdot t\right) + b[n]\cdot\sin\left(\frac{n\cdot \mathrm{Pi}}{L}\cdot t\right), n = 1..500\right):$

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

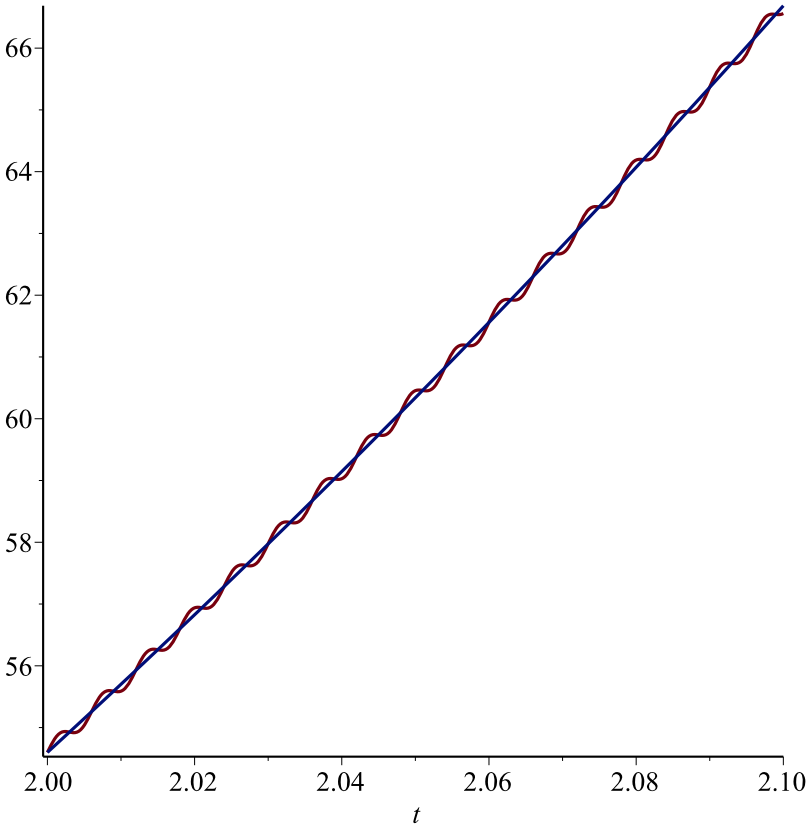


> $plot(\{STF500, f\}, t = 2..2.1)$



> $STF1000 := \frac{a[0]}{2} + sum\left(a[n]\cdot\cos\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right) + b[n]\cdot\sin\left(\frac{n\cdot\mathrm{Pi}}{L}\cdot t\right), n = 1..1000\right) :$

> $plot(\{STF1000, f\}, t = 2..2.1)$



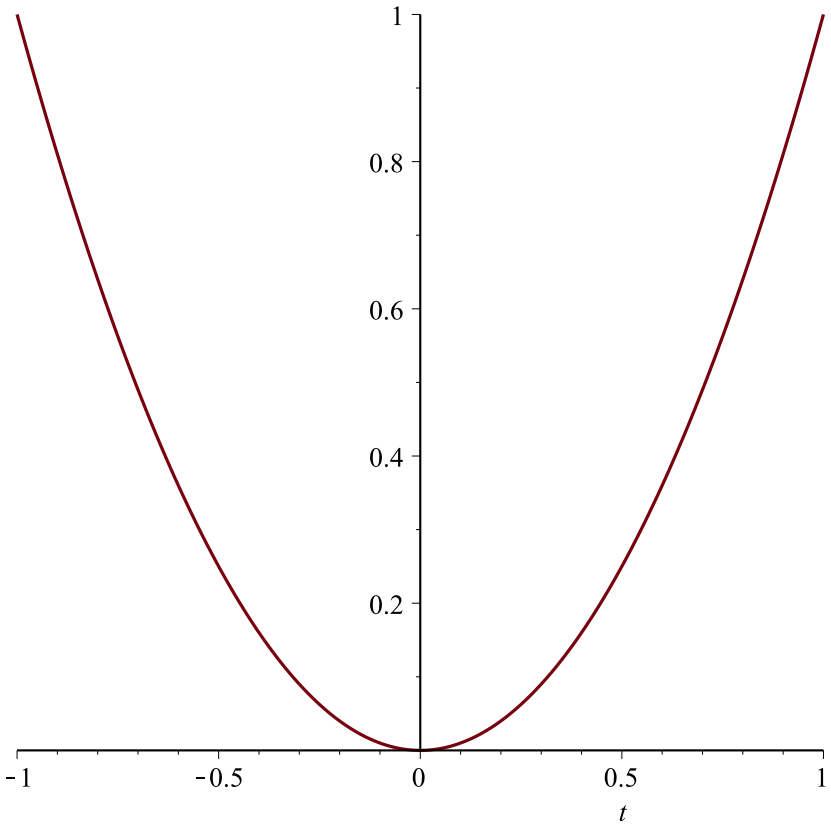

```
> restart
> g := t^2
```

$$g := t^2 \quad \textbf{(7)}$$

```
> L := 1
```

$$L := 1 \quad \textbf{(8)}$$

```
> plot(g, t = -L..L)
```



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

$$a_0 := \frac{2}{3} \tag{9}$$

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

$$a_n := \frac{4\,(-1)^n}{n^2\,\pi^2} \tag{10}$$

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

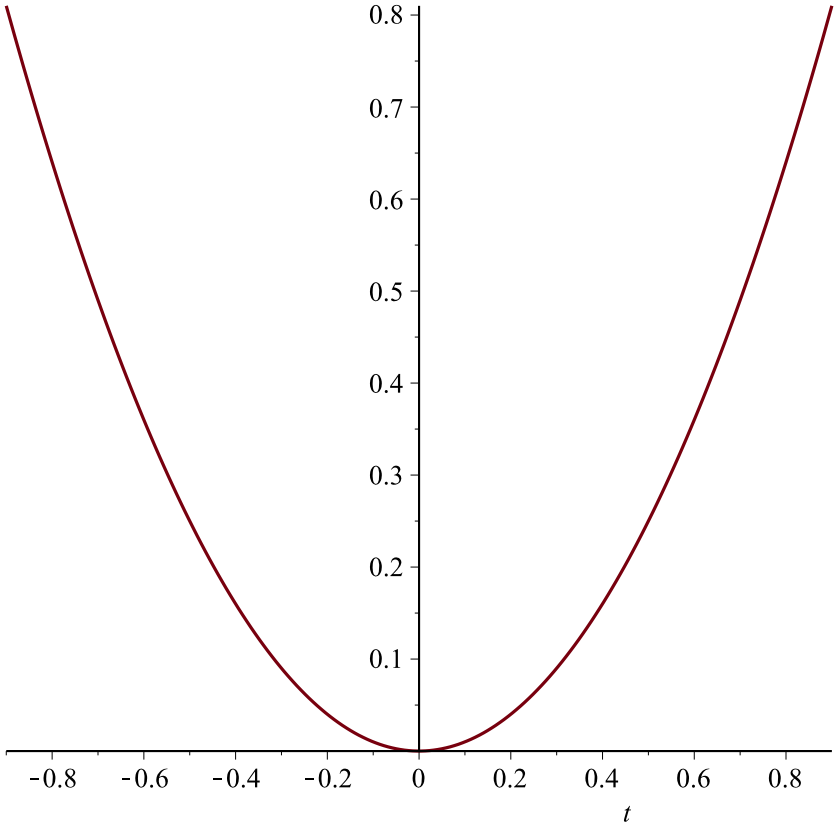
$$b_n := 0 \tag{11}$$

> $STF := \frac{a[0]}{2} + Sum\left(a[n] \cdot \cos\left(\frac{n \cdot \mathrm{Pi}}{L} \cdot t\right), n = 1..infinity\right)$

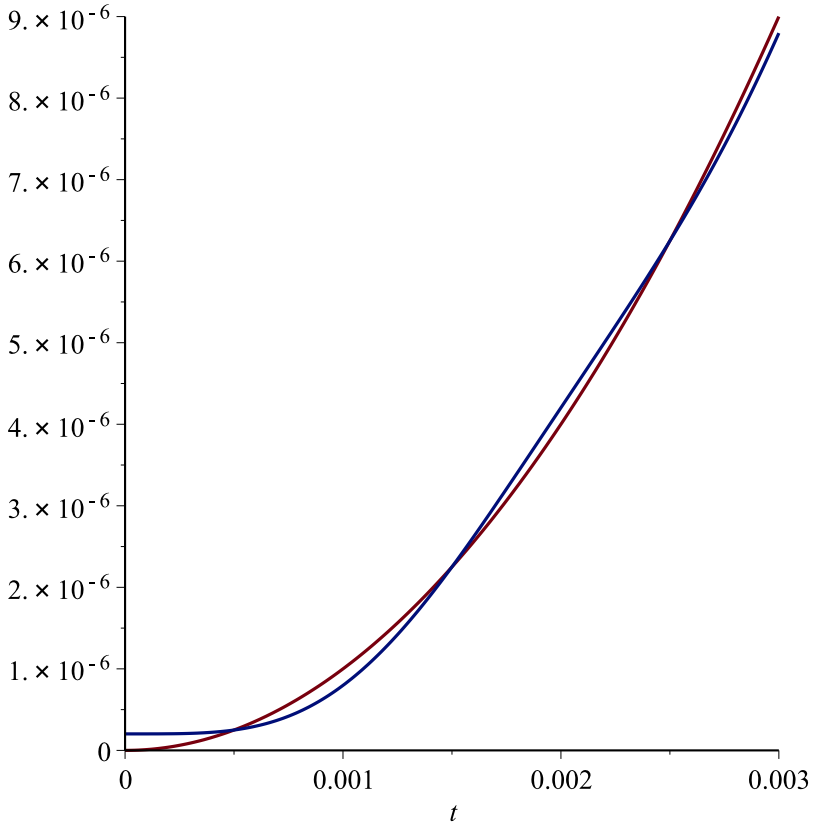
$$STF := \frac{1}{3} + \sum_{n=1}^{\infty} \frac{4\,(-1)^n \cos(n\,\pi\,t)}{n^2\,\pi^2} \tag{12}$$

> $STF1000 := \frac{a[0]}{2} + Sum\left(a[n] \cdot \cos\left(\frac{n \cdot \mathrm{Pi}}{L} \cdot t\right), n = 1..1000\right) :$

> $plot(STF1000, t = -0.9 .. 0.9)$



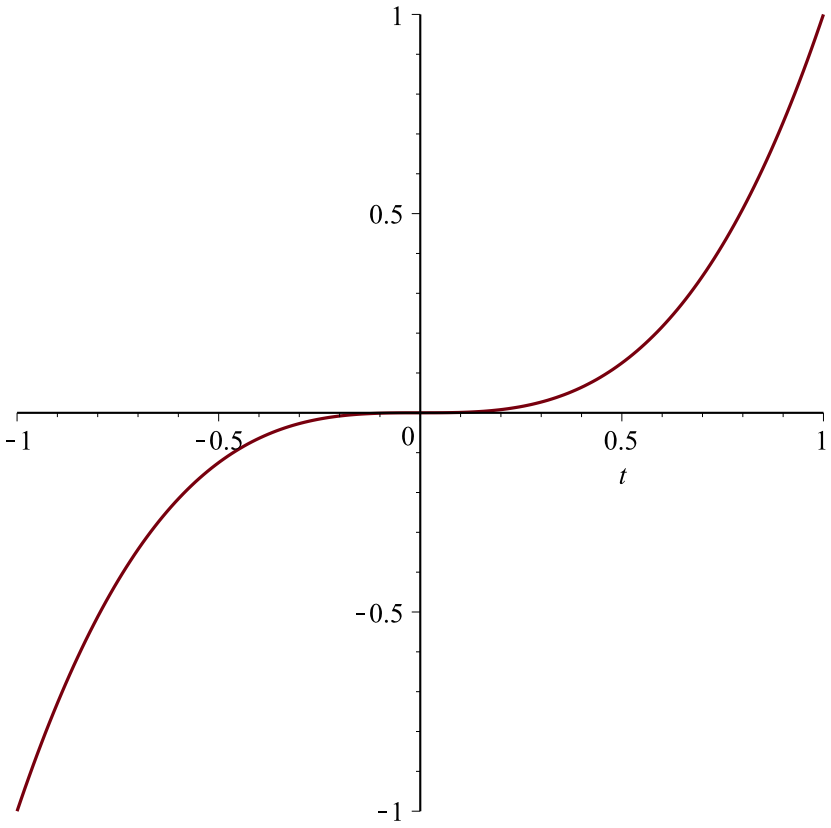
> $plot(\{g, STF1000\}, t = 0 .. 0.003)$




```
> restart
> h := t^3
```

$$h := t^3 \tag{13}$$

```
> plot(h, t = -1..1)
```



> $L := 1$

$$L := 1 \tag{14}$$

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

$$a_0 := 0 \tag{15}$$

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

$$a_n := 0 \tag{16}$$

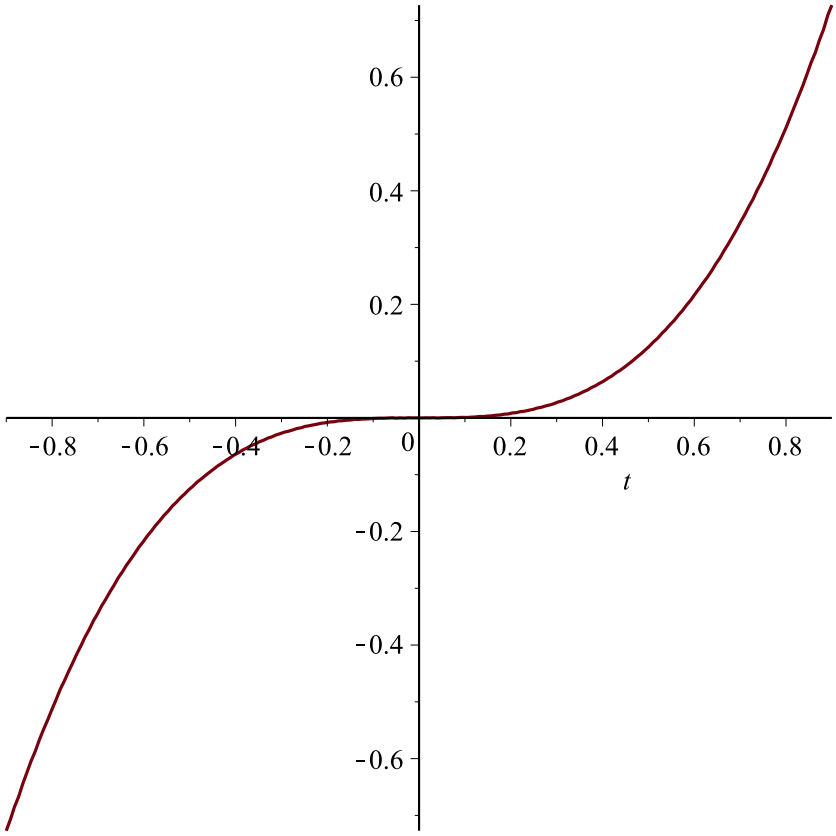
> $b[n] := subs\left(\sin(n \cdot \mathrm{Pi}) = 0, \cos(n \cdot \mathrm{Pi}) = (-1)^n, \frac{1}{L} \cdot int\left(h \cdot \sin\left(\frac{n \cdot \mathrm{Pi}}{L} \cdot t\right), t = -L..L\right)\right)$

$$b_n := -\frac{2\left(n^3 \pi^3 (-1)^n - 6 (-1)^n \pi n\right)}{n^4 \pi^4} \tag{17}$$

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

$$STF := \sum_{n=1}^{\infty} \left(-\frac{2\left(n^3 \pi^3 (-1)^n - 6 (-1)^n \pi n\right) \sin(n \pi t)}{n^4 \pi^4} \right) \tag{18}$$

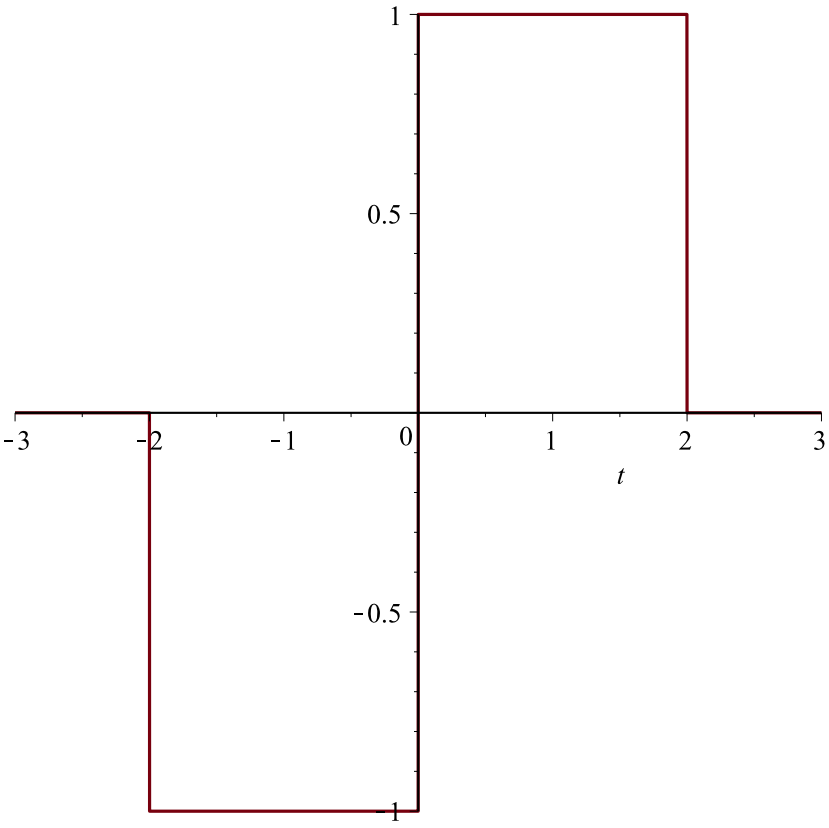
```
> STF1000 := sum(b[n]·sin((n·Pi/L)·t), n = 1..1000) :
> plot(STF1000, t = -0.9..0.9)
```




```
> restart
> f := -Heaviside(t + 2) + 2 Heaviside(t) - Heaviside(t - 2)
```

$$f := -\text{Heaviside}(t+2) + 2\,\text{Heaviside}(t) - \text{Heaviside}(t-2) \qquad \textbf{(19)}$$

```
> plot(f, t = -3..3)
```



> $L := 3$

$$L := 3 \tag{20}$$

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

$$a_0 := 0 \tag{21}$$

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

$$a_n := 0 \tag{22}$$

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

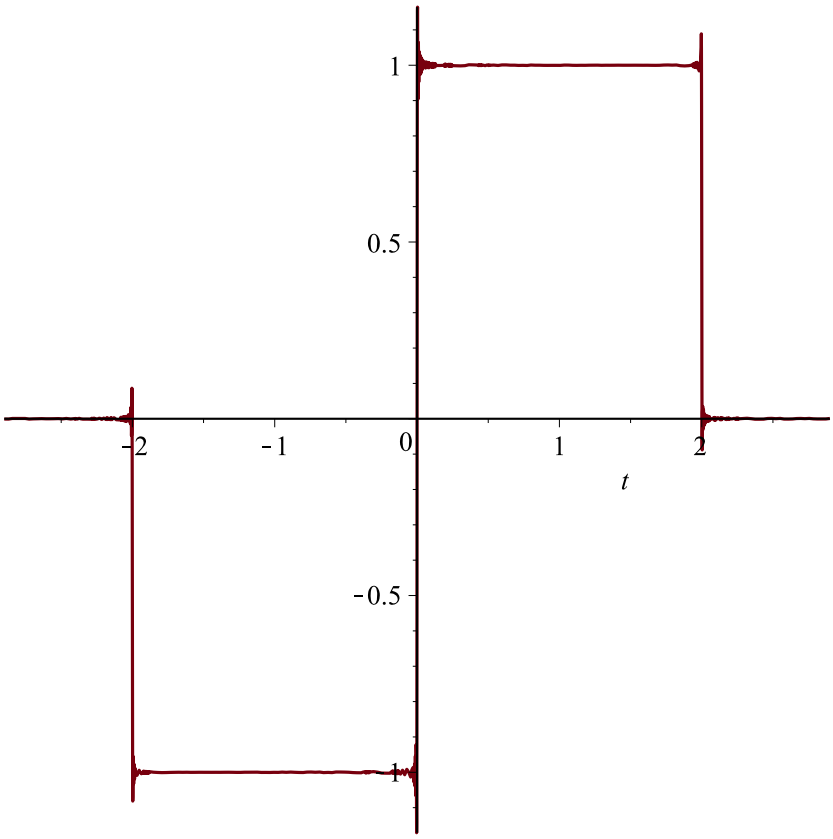
$$b_n := -\frac{2\cos\left(\frac{2}{3} n \pi\right)}{n \pi} + \frac{2}{n \pi} \tag{23}$$

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

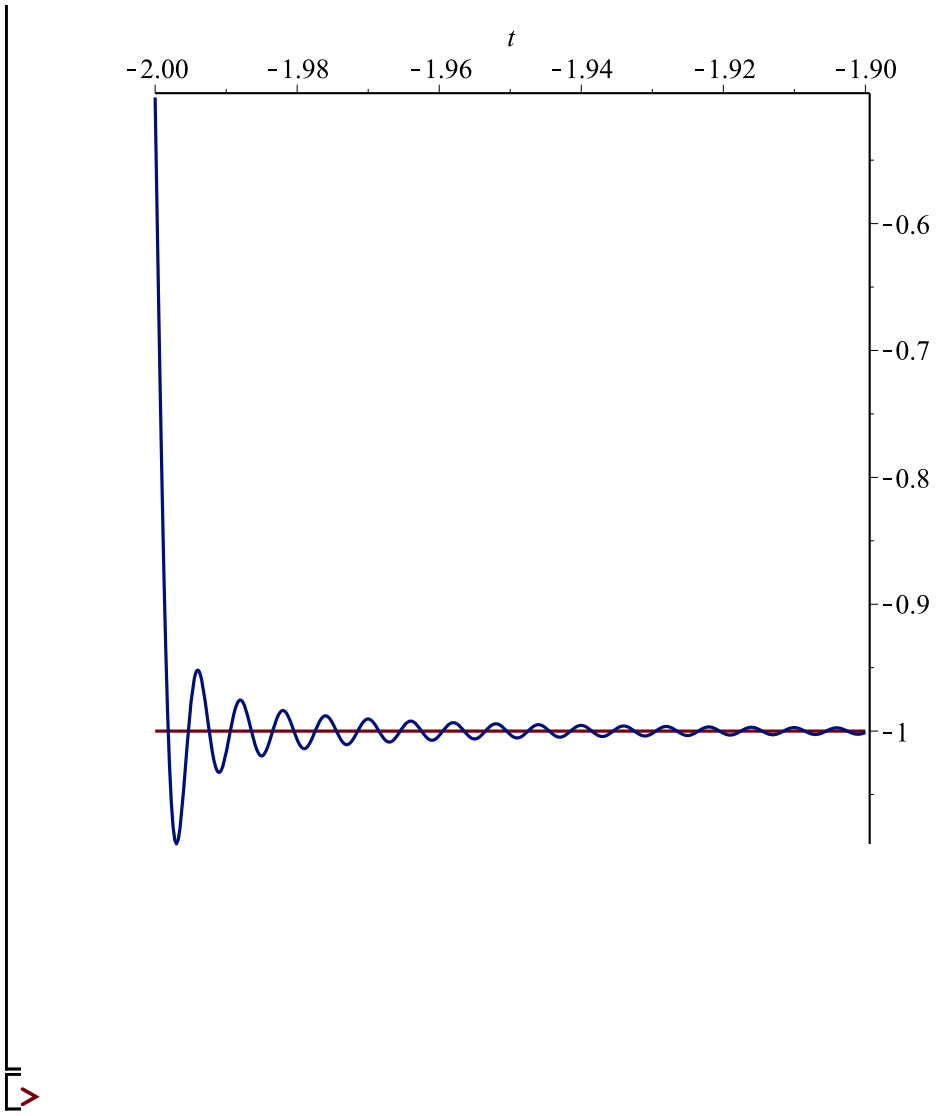
(24)

$$STF := \sum_{n=1}^{\infty} \left(-\frac{2\cos\left(\frac{2}{3} n \pi\right)}{n \pi} + \frac{2}{n \pi} \right) \sin\left(\frac{1}{3} n \pi t\right) \quad (24)$$

```
> STF1000 := sum(b[n]·sin((n·Pi/L)·t), n = 1..1000):
> plot(STF1000, t = -2.9..2.9)
```




```
> plot({f, STF1000}, t = -2..-1.9)
```


t
-2.00
-1.98
-1.96
-1.94
-1.92
-1.90
-0.6
-0.7
-0.8
-0.9
-1

>