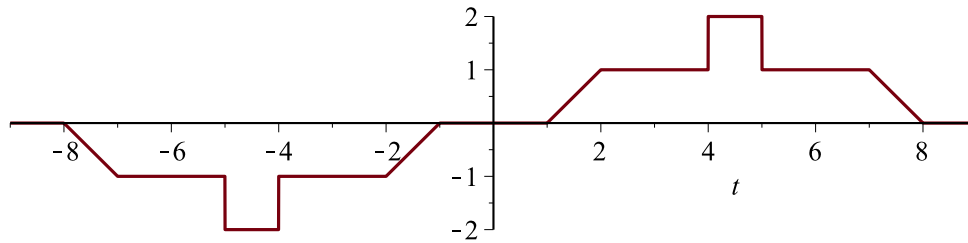


```
> restart
> L := 9
```

$L := 9$

(1)

```
> f := -(t + 8) · Heaviside(t + 8) + (t + 7) · Heaviside(t + 7) - Heaviside(t + 5) + Heaviside(t
+ 4) + (t + 2) · Heaviside(t + 2) - (t + 1) · Heaviside(t + 1) + (t - 1) · Heaviside(t - 1)
- (t - 2) · Heaviside(t - 2) + Heaviside(t - 4) - Heaviside(t - 5) - (t - 7) · Heaviside(t
- 7) + (t - 8) · Heaviside(t - 8) : plot(f, t = -L .. L, scaling = CONSTRAINED)
```



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

$a_0 := 0$

(2)

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

$a_n := 0$

(3)

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

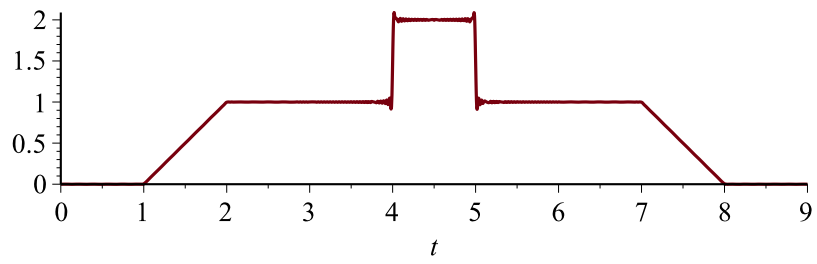
$$b_n := -\frac{9 \left(\sin\left(\frac{1}{9} n \pi\right) - \frac{1}{9} \cos\left(\frac{1}{9} n \pi\right) n \pi \right)}{n^2 \pi^2} + \frac{9 \left(\sin\left(\frac{2}{9} n \pi\right) - \frac{2}{9} \cos\left(\frac{2}{9} n \pi\right) n \pi \right)}{n^2 \pi^2}$$

(4)

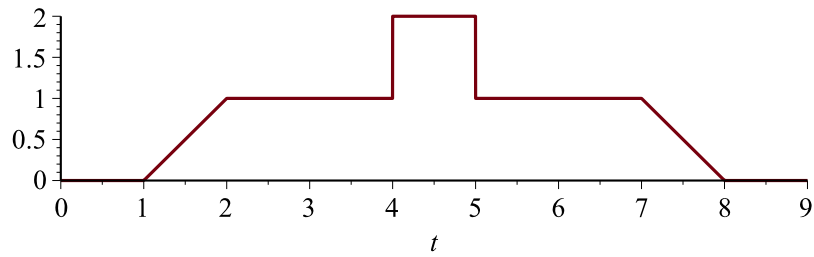
$$\begin{aligned}
& + \frac{9 \left(\sin\left(\frac{7}{9} n \pi\right) - \frac{7}{9} \cos\left(\frac{7}{9} n \pi\right) n \pi \right)}{n^2 \pi^2} - \frac{9 \left(\sin\left(\frac{8}{9} n \pi\right) - \frac{8}{9} \cos\left(\frac{8}{9} n \pi\right) n \pi \right)}{n^2 \pi^2} \\
& - \frac{16 \cos\left(\frac{8}{9} n \pi\right)}{n \pi} + \frac{14 \cos\left(\frac{7}{9} n \pi\right)}{n \pi} - \frac{2 \cos\left(\frac{5}{9} n \pi\right)}{n \pi} + \frac{2 \cos\left(\frac{4}{9} n \pi\right)}{n \pi} \\
& + \frac{4 \cos\left(\frac{2}{9} n \pi\right)}{n \pi} - \frac{2 \cos\left(\frac{1}{9} n \pi\right)}{n \pi} - \frac{9 \left(-\sin\left(\frac{2}{9} n \pi\right) + \frac{2}{9} \cos\left(\frac{2}{9} n \pi\right) n \pi \right)}{n^2 \pi^2} \\
& + \frac{9 \left(-\sin\left(\frac{1}{9} n \pi\right) + \frac{1}{9} \cos\left(\frac{1}{9} n \pi\right) n \pi \right)}{n^2 \pi^2} \\
& - \frac{9 \left(-\sin\left(\frac{7}{9} n \pi\right) + \frac{7}{9} \cos\left(\frac{7}{9} n \pi\right) n \pi \right)}{n^2 \pi^2} \\
& + \frac{9 \left(-\sin\left(\frac{8}{9} n \pi\right) + \frac{8}{9} \cos\left(\frac{8}{9} n \pi\right) n \pi \right)}{n^2 \pi^2}
\end{aligned}$$

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

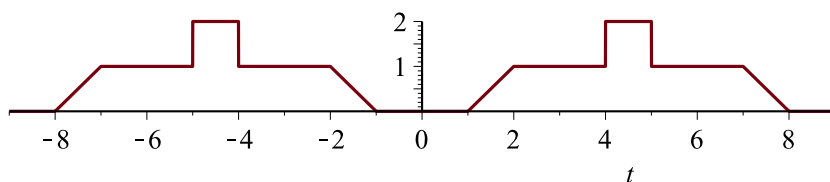
> $\text{plot}(STF500, t = 0 \dots L, \text{scaling} = \text{CONSTRAINED})$



`> plot(f, t = 0 .. L, scaling = CONSTRAINED)`



```
> g := (t + 8) * Heaviside(t + 8) - (t + 7) * Heaviside(t + 7) + Heaviside(t + 5) - Heaviside(t + 4)
- (t + 2) * Heaviside(t + 2) + (t + 1) * Heaviside(t + 1) + (t - 1) * Heaviside(t - 1) - (t
- 2) * Heaviside(t - 2) + Heaviside(t - 4) - Heaviside(t - 5) - (t - 7) * Heaviside(t - 7)
+ (t - 8) * Heaviside(t - 8) : plot(g, t = -L..L, scaling = CONSTRAINED)
```



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

$$a_0 := \frac{14}{9} \quad (5)$$

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

$$a_n := - \frac{18 \left(\cos\left(\frac{1}{9} n \pi\right) + \frac{1}{9} n \pi \sin\left(\frac{1}{9} n \pi\right) \right)}{n^2 \pi^2} \quad (6)$$

$$+ \frac{18 \left(\cos\left(\frac{7}{9} n \pi\right) + \frac{7}{9} n \pi \sin\left(\frac{7}{9} n \pi\right) \right)}{n^2 \pi^2}$$

$$+ \frac{18 \left(\cos\left(\frac{2}{9} n \pi\right) + \frac{2}{9} n \pi \sin\left(\frac{2}{9} n \pi\right) \right)}{n^2 \pi^2} - \frac{2 \sin\left(\frac{4}{9} n \pi\right)}{n \pi} + \frac{2 \sin\left(\frac{5}{9} n \pi\right)}{n \pi}$$

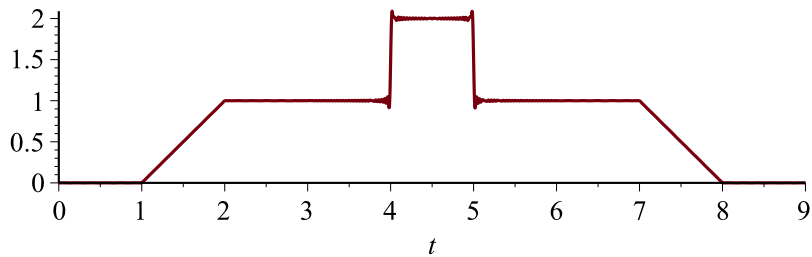
$$+ \frac{2 \sin\left(\frac{1}{9} n \pi\right)}{n \pi} - \frac{4 \sin\left(\frac{2}{9} n \pi\right)}{n \pi} - \frac{18 \left(\cos\left(\frac{8}{9} n \pi\right) + \frac{8}{9} n \pi \sin\left(\frac{8}{9} n \pi\right)\right)}{n^2 \pi^2}$$

$$- \frac{14 \sin\left(\frac{7}{9} n \pi\right)}{n \pi} + \frac{16 \sin\left(\frac{8}{9} n \pi\right)}{n \pi}$$

```
> b[n] := simplify(subs(sin(n·Pi) = 0, cos(n·Pi) = (-1)^n, 1/L · int(g·sin(n·Pi/L · t), t = -L..L)))
                                b_n := 0 (7)
```

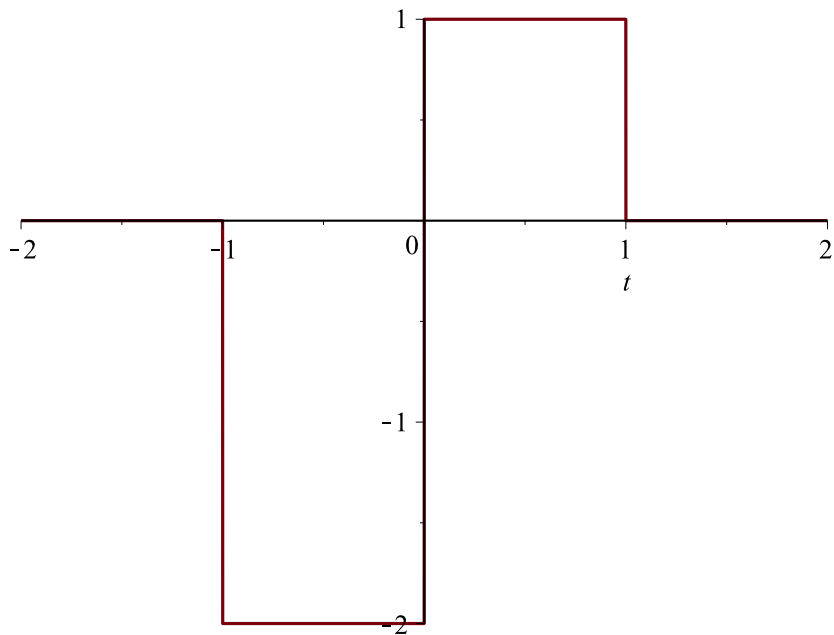
```
> STF500G := a[0]/2 + sum(a[n]·cos(n·Pi/L · t), n = 1..500) :
```

```
> plot(STF500, t = 0..L, scaling = CONSTRAINED)
```



```
> restart
```

```
> f := -2·Heaviside(t + 1) + 3·Heaviside(t) - Heaviside(t - 1) : plot(f, t = -2..2, scaling = CONSTRAINED)
```



```
> restart
```

```
> Ecua := diff(y(t), t, t) + 4*y(t) = sin(t) * Heaviside(t - 2*Pi)
```

$$Ecua := \frac{d^2}{dt^2} y(t) + 4y(t) = \sin(t) \text{ Heaviside}(t - 2\pi) \quad (8)$$

```
> CondIni := y(0) = 1, D(y)(0) = 0
```

$$CondIni := y(0) = 1, D(y)(0) = 0 \quad (9)$$

```
> with(inttrans) :
```

```
> EcuaTL := subs(CondIni, laplace(Ecua, t, s))
```

$$EcuaTL := s^2 \text{laplace}(y(t), t, s) - s + 4 \text{laplace}(y(t), t, s) = \frac{e^{-2s\pi}}{s^2 + 1} \quad (10)$$

```
> SolTL := simplify(isolate(EcuaTL, laplace(y(t), t, s)))
```

$$SolTL := \text{laplace}(y(t), t, s) = \frac{s^3 + e^{-2s\pi} + s}{(s^2 + 1)(s^2 + 4)} \quad (11)$$

```
> SolPart := invlaplace(SolTL, s, t)
```

$$SolPart := y(t) = \cos(2t) + \frac{1}{6} (-\sin(2t) + 2\sin(t)) \text{Heaviside}(t - 2\pi) \quad (12)$$

```
>
```

