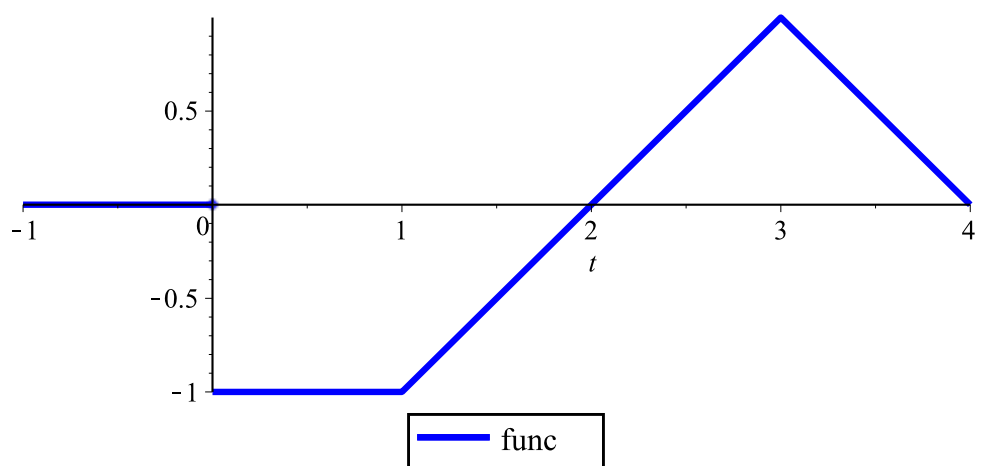>

$$\begin{cases} 0 & t \leq 0 \\ -1 & 0 < t \text{ and } t \leq a\sim \\ \dfrac{t - 2\,a\sim}{a\sim} & a\sim\, < t \text{ and } t \leq 3\,a\sim \\ -\dfrac{t - 4\,a\sim}{a\sim} & 3\,a\sim\, < t \text{ and } t \leq 4\,a\sim \end{cases}$$

func

$fp := -\text{Heaviside}(t) + \dfrac{\text{Heaviside}(t - a\sim)\,(t - a\sim)}{a\sim} - \dfrac{\text{Heaviside}(t - 3\,a\sim)\,(2\,t - 6\,a\sim)}{a\sim}$

$\quad + \dfrac{\text{Heaviside}(t - 4\,a\sim)\,(t - 4\,a\sim)}{a\sim}$

$$laplace\_original := -\frac{1}{p} + \frac{e^{-p\,a\sim} + e^{-4\,p\,a\sim} - 2\,e^{-3\,p\,a\sim}}{a\sim\,p^2} \tag{1}$$

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$$"\ 2\ "$$

$$fp := \frac{4\,p + 5}{(p - 2)\,(p^2 + 4\,p + 5)}$$

$$invlaplace\left(\frac{4\,p + 5}{(p - 2)\,(p^2 + 4\,p + 5)}, p, t \right) \tag{2}$$

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$$"\ 3\ "$$

$$de := \frac{d^2}{dt^2}\,y(t) - 2\left(\frac{d}{dt}\,y(t) \right) + y(t) = \frac{e^t}{t^2 + 1}$$

$$y(t) = -\frac{1}{2}\,e^t\left(-2\arctan(t)\,t + \ln(t^2 + 1) \right) \tag{3}$$

>

$$" \; 4 \; "$$

$$cond := y(0) = 3, \text{D}(y)(0) = 1$$

$$de := \frac{d^2}{dt^2}\, y(t) + y(t) = 6\,e^{-t}$$

$$y(t) = 4\sin(t) + 3\,e^{-t} \tag{4}$$

$$" \; 5 \; "$$

$$de1 := \frac{d}{dt}\, x(t) = x(t) + 3\,y(t) + 2$$

$$de2 := \frac{d}{dt}\, y(t) = x(t) - y(t) + 1$$

$$cond := x(0) = -1, y(0) = 2$$

$$\left\{ x(t) = \frac{15}{8}\,e^{2t} - \frac{13}{8}\,e^{-2t} - \frac{5}{4},\, y(t) = \frac{5}{8}\,e^{2t} + \frac{13}{8}\,e^{-2t} - \frac{1}{4} \right\} \tag{5}$$