> $dsolve\left(diff(x(t),t) + x(t) = \frac{2}{\mathrm{sqrt}(\pi)}\exp(-t^2 - t), x(t)\right)$

$$x(t) = (\mathrm{erf}(t) + \_C1)\,\mathrm{e}^{-t} \tag{1}$$

> $int(\exp(t^2), t)$

$$-\frac{1}{2}\,\mathrm{I}\sqrt{\pi}\,\mathrm{erf}(\mathrm{I}\,t) \tag{2}$$

> $int\left(\frac{2}{\mathrm{sqrt}(\mathrm{Pi})}\cdot\exp(-t^2), t\right)$

$$\mathrm{erf}(t) \tag{3}$$

> $sol := dsolve(diff(x(t), t\$2) + 3\cdot diff(x(t),t) + x(t) = 1, x(t))$

$$sol := x(t) = \mathrm{e}^{\frac{1}{2}(\sqrt{5}-3)t}\,\_C2 + \mathrm{e}^{-\frac{1}{2}(\sqrt{5}+3)t}\,\_C1 + 1 \tag{4}$$

> $\lim = limit(rhs(sol), t = infinity)$

$$\lim = 1 \tag{5}$$

> $sol := dsolve\left(\left\{diff(x(t), t\$2) + 4\cdot x(t) = 1, x(0) = \frac{5}{4}, \mathrm{D}(x)(0) = 0\right\}, x(t)\right)$

$$sol := x(t) = \frac{1}{4} + \cos(2\,t) \tag{6}$$

> $eval(sol, t = \mathrm{Pi})$

$$x(\pi) = \frac{5}{4} \tag{7}$$

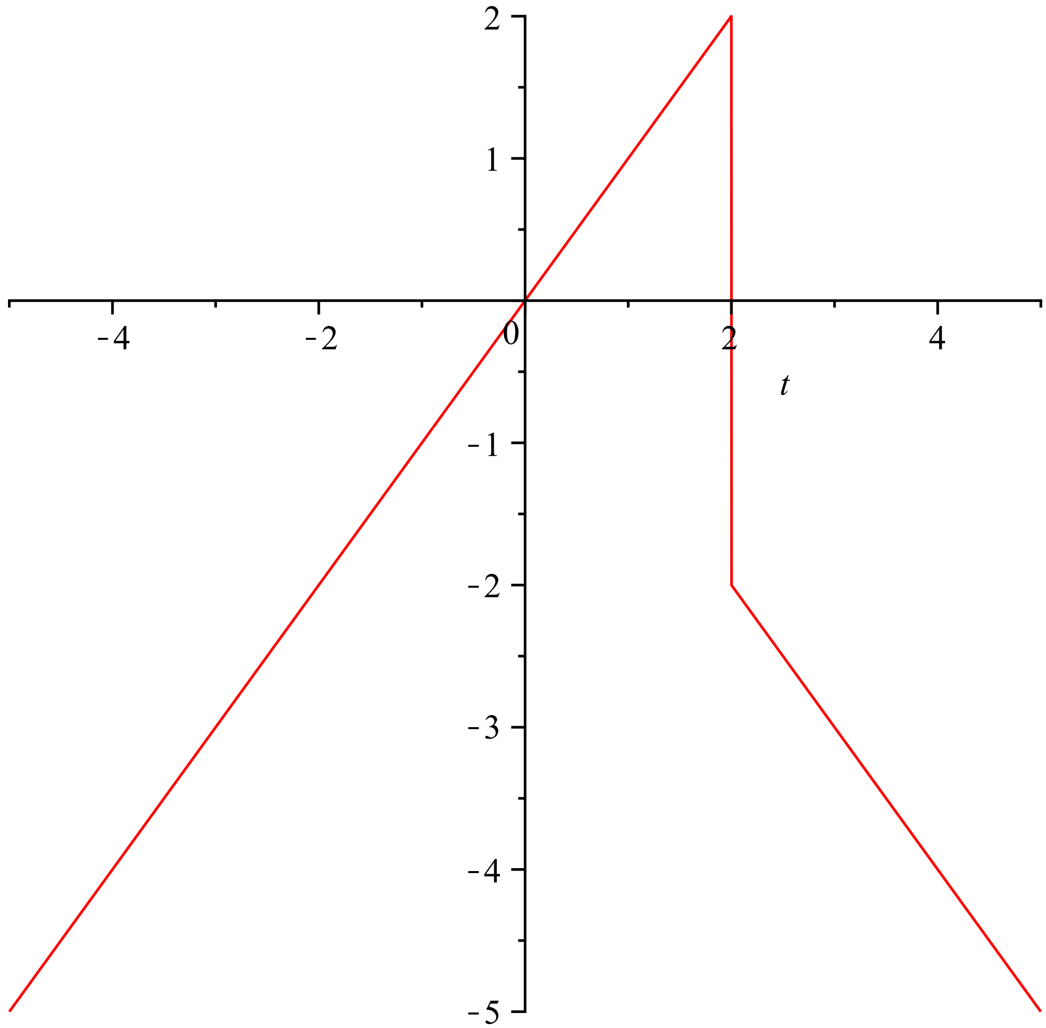
> $dsolve(diff(x(t),t) - 3\cdot x(t) = t^3, x(t))$

$$x(t) = -\frac{2}{27} - \frac{2}{9}\,t - \frac{1}{3}\,t^2 - \frac{1}{3}\,t^3 + \mathrm{e}^{3t}\,\_C1 \tag{8}$$

> $\mathrm{phi} := piecewise(t \le 2, t, 3\,t > 2, -t)$

$$\phi := \begin{cases} t & t \le 2 \\ -t & 2 < 3\,t \end{cases} \tag{9}$$

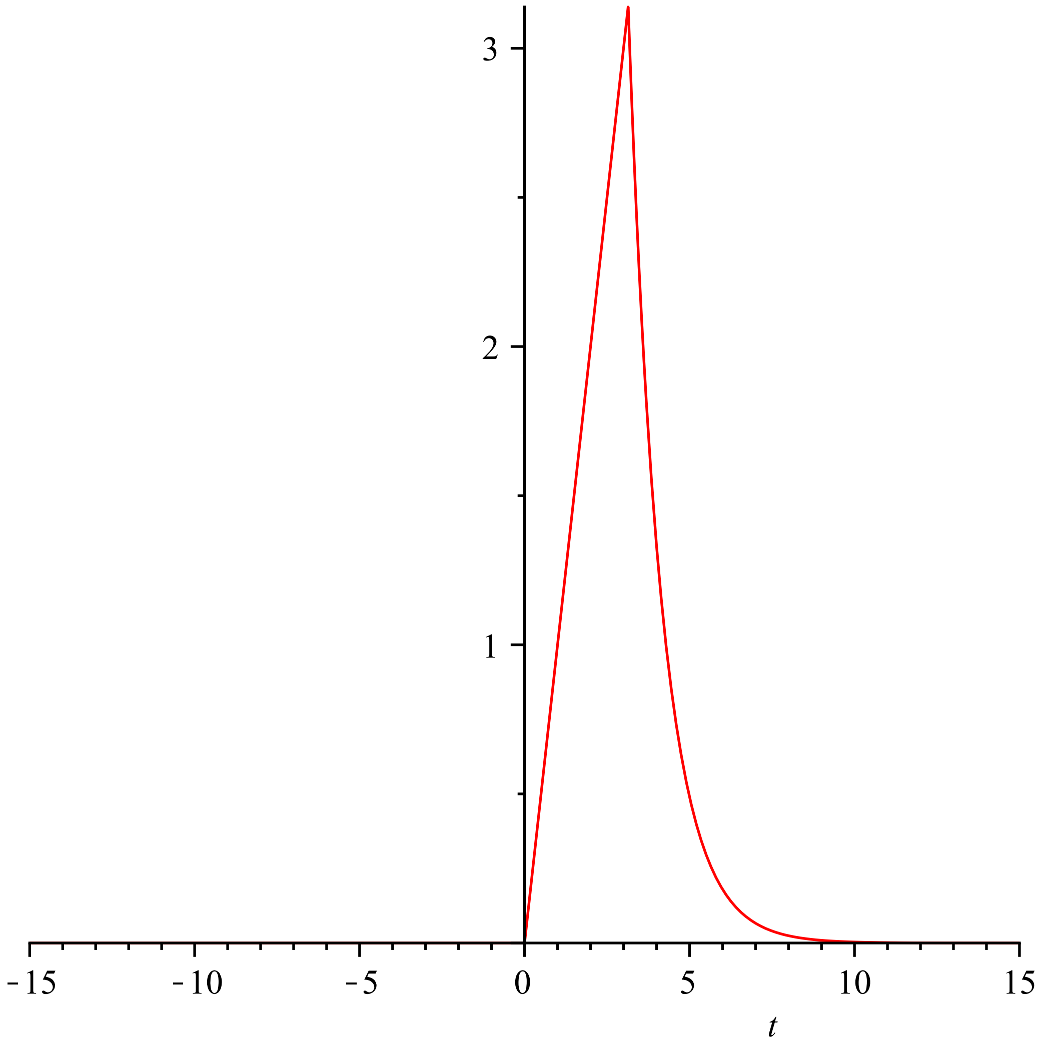
> $plot(\mathrm{phi}, t = -5..5)$



> phi := *piecewise*$(0 \leq t \leq \mathrm{Pi}, t, t > \mathrm{Pi}, \mathrm{Pi}\cdot\exp(\mathrm{Pi} - t))$

$$\phi := \begin{cases} t & 0 \leq t \textbf{ and } t \leq \pi \\ \pi\, e^{\pi - t} & \pi < t \end{cases} \tag{10}$$

> *plot*(phi, $t = -15..15$)



> $sol_1 := \mathbf{dsolve}(\{diff(x(t), t\$2) + x(t) = t, x(0) = 0, \mathrm{D}(x)(0) = 1\}, x(t))$

$$sol_1 := x(t) = t \qquad (11)$$

> $sol_1 := rhs(sol_1)$

$$sol_1 := t \qquad (12)$$

> $sol_2 := dsolve(\{diff(x(t), t\$2) + x(t) = \mathrm{Pi} * e^{\mathrm{Pi} - t}, x(\mathrm{Pi}) = \mathrm{Pi}, \mathrm{D}(x)(\mathrm{Pi}) = \mathrm{Pi}\}, x(t))$

$$sol_2 := x(t) = -\frac{\sin(t)\,\pi\,(1 + \ln(e)^2 + \ln(e))}{1 + \ln(e)^2} - \frac{\cos(t)\,\pi\ln(e)^2}{1 + \ln(e)^2} + \frac{\pi\,e^{\pi - t}}{1 + \ln(e)^2} \qquad (13)$$

> $sol_2 := rhs(sol_2)$

$$sol_2 := -\frac{\sin(t)\,\pi\,(1 + \ln(e)^2 + \ln(e))}{1 + \ln(e)^2} - \frac{\cos(t)\,\pi\ln(e)^2}{1 + \ln(e)^2} + \frac{\pi\,e^{\pi - t}}{1 + \ln(e)^2} \qquad (14)$$

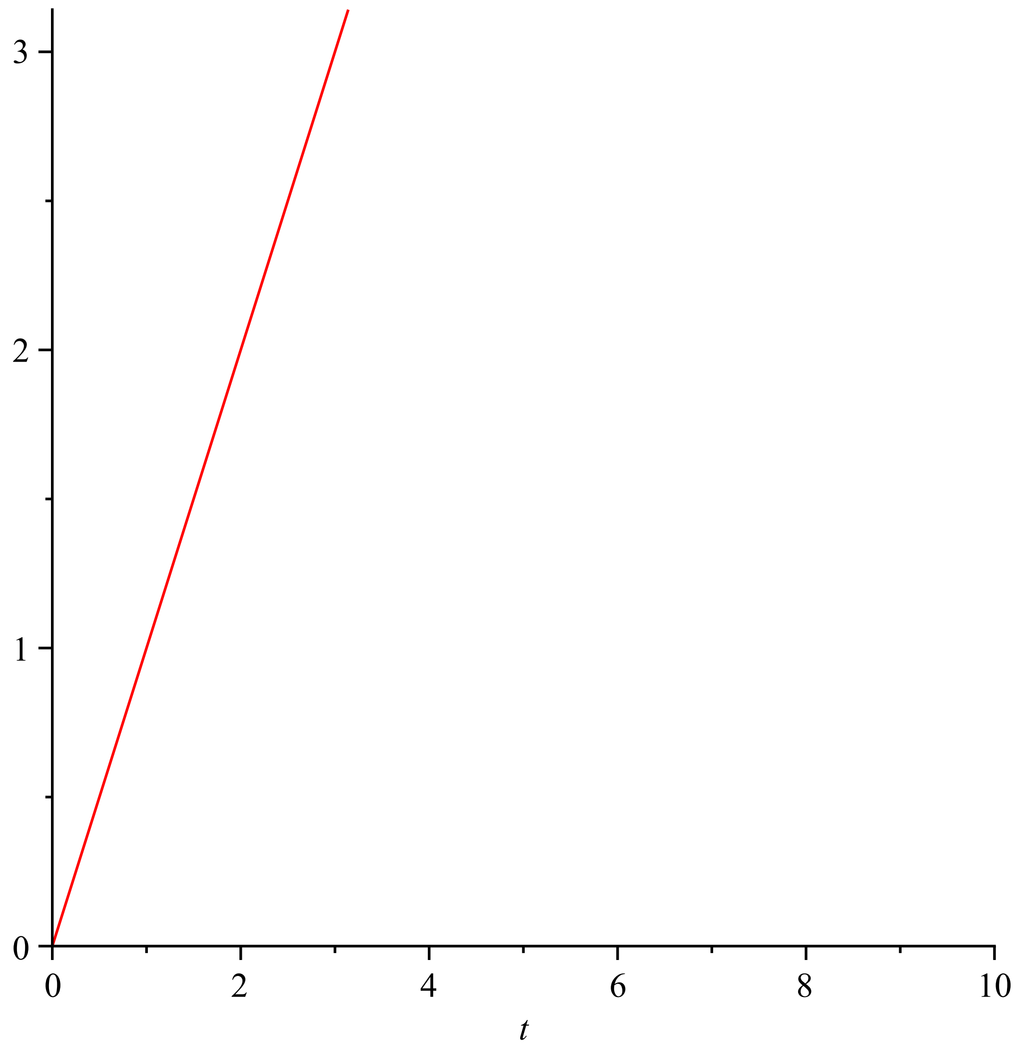
> $sol := piecewise(0 \le t \le \mathrm{Pi}, sol_1, \mathrm{Pi} < t, sol_2)$

$sol :=$ (15)

$$\begin{cases} t & 0 \le t \text{ and } t \le \pi \\ -\frac{\sin(t)\,\pi\,(1+\ln(e)^2+\ln(e))}{1+\ln(e)^2} - \frac{\cos(t)\,\pi\,\ln(e)^2}{1+\ln(e)^2} + \frac{\pi\,e^{\pi-t}}{1+\ln(e)^2} & \pi < t \end{cases}$$

>

> $plot(sol, t = 0 ..10)$



> $de := diff(x(t), t\$2) + x(t) = \cos(\text{omega} * t)$

$$de := \frac{d^2}{dt^2}\, x(t) + x(t) = \cos(\omega\, t) \tag{16}$$

> $\text{ics} := \text{x}(0) = 0, \text{D}(\text{x})(0) = 0$

$$ics := x(0) = 0, \mathrm{D}(x)(0) = 0 \tag{17}$$

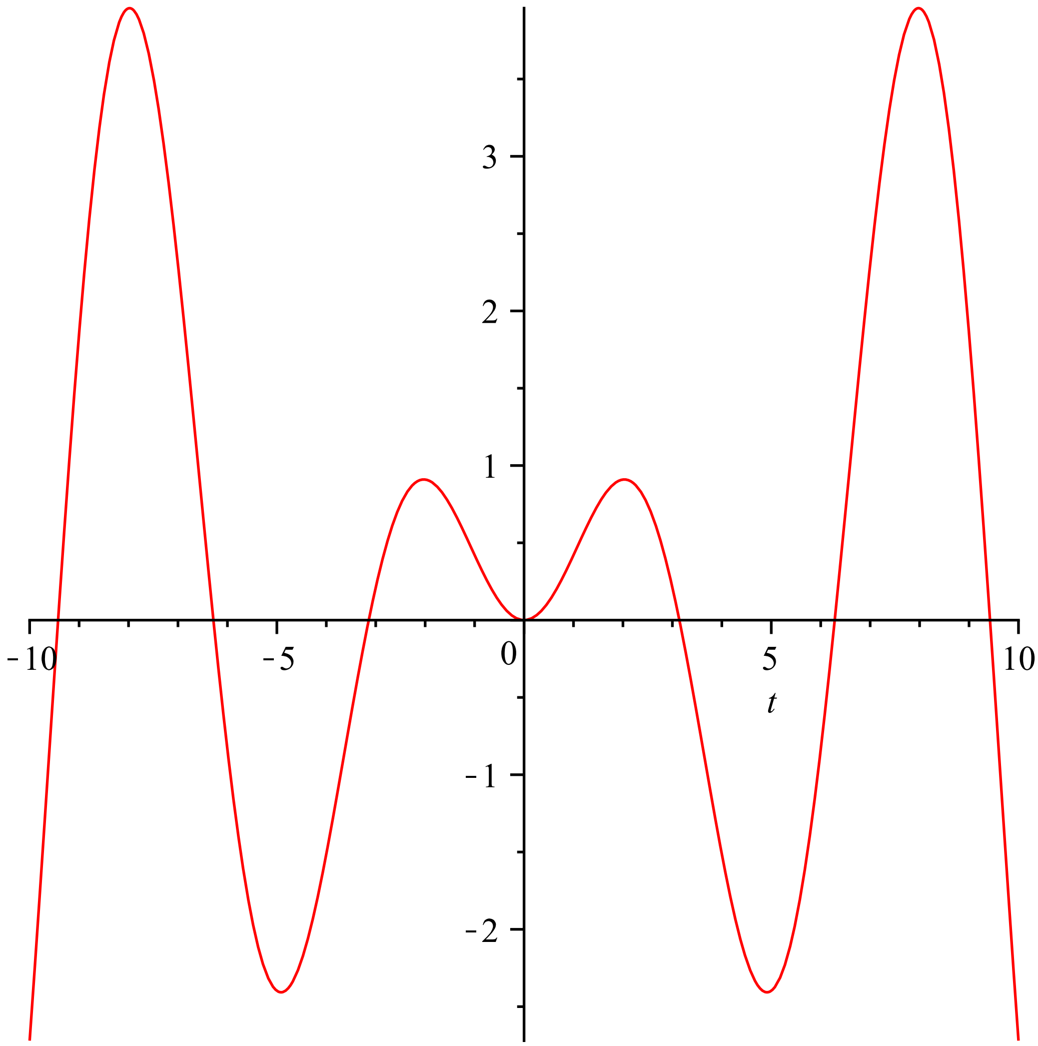
> $sol := dsolve(\{de, ics\}, x(t))$

$$sol := x(t) = \frac{\cos(t)}{-1+\omega^2} - \frac{\cos(\omega\, t)}{-1+\omega^2} \tag{18}$$

> $sol := dsolve(\{de, cond\}, x(t))$

$$sol := x(t) = \frac{1}{2}\, t \sin(t) \tag{19}$$

> $plot(rhs(sol), t=-10..10)$



> $de := diff(x(t), t\$2) - 4\cdot x(t) = \exp(\mathrm{alpha}\cdot t)$

$$de := \frac{d^2}{dt^2}\, x(t) - 4\, x(t) = e^{\alpha t} \tag{20}$$

> $ics := x(0) = 0, D(x)(0) = 0$

$$ics := x(0) = 0, D(x)(0) = 0 \tag{21}$$

> $sol := dsolve(\{de, ics\}, x(t))$

$$sol := x(t) = \frac{1}{4}\,\frac{e^{-2t}}{\alpha+2} - \frac{1}{4}\,\frac{e^{2t}}{\alpha-2} + \frac{e^{\alpha t}}{-4+\alpha^2} \tag{22}$$

> alpha := 2

$$\alpha := 2 \tag{23}$$

> $sol2 := dsolve(\{de, ics\}, x(t))$

$$sol2 := x(t) = \frac{1}{16}\, e^{-2t} - \frac{1}{16}\, e^{2t} + \frac{1}{4}\, t\, e^{2t} \tag{24}$$

> $sol2expr := rhs(sol2)$

$$sol2expr := \frac{1}{16}\, e^{-2t} - \frac{1}{16}\, e^{2t} + \frac{1}{4}\, t\, e^{2t} \tag{25}$$