> *restart*

> $$f(t) = 4t^2 - e^{-t} - \int_0^t f(\tau)\, e^{t-\tau}\, d\tau$$

> *Ecuacion* := $f(t) = 4 \cdot t \cdot\cdot 2 - \exp(-t) - int(f(\text{tau}) \cdot \exp(t - \text{tau}), \text{tau} = 0 \,..t)$

$$Ecuacion := f(t) = 4\,t^2 - \mathrm{e}^{-t} - \left(\int_0^t f(\tau)\,\mathrm{e}^{t-\tau}\,\mathrm{d}\tau\right) \quad \textbf{(1)}$$

> *with*(*inttrans*) :

> *TLE* := *laplace*(*Ecuacion*, *t*, *s*)

$$TLE := laplace(f(t), t, s) = \frac{8}{s^3} - \frac{1}{1+s} - \frac{laplace(f(t), t, s)}{s-1} \quad \textbf{(2)}$$

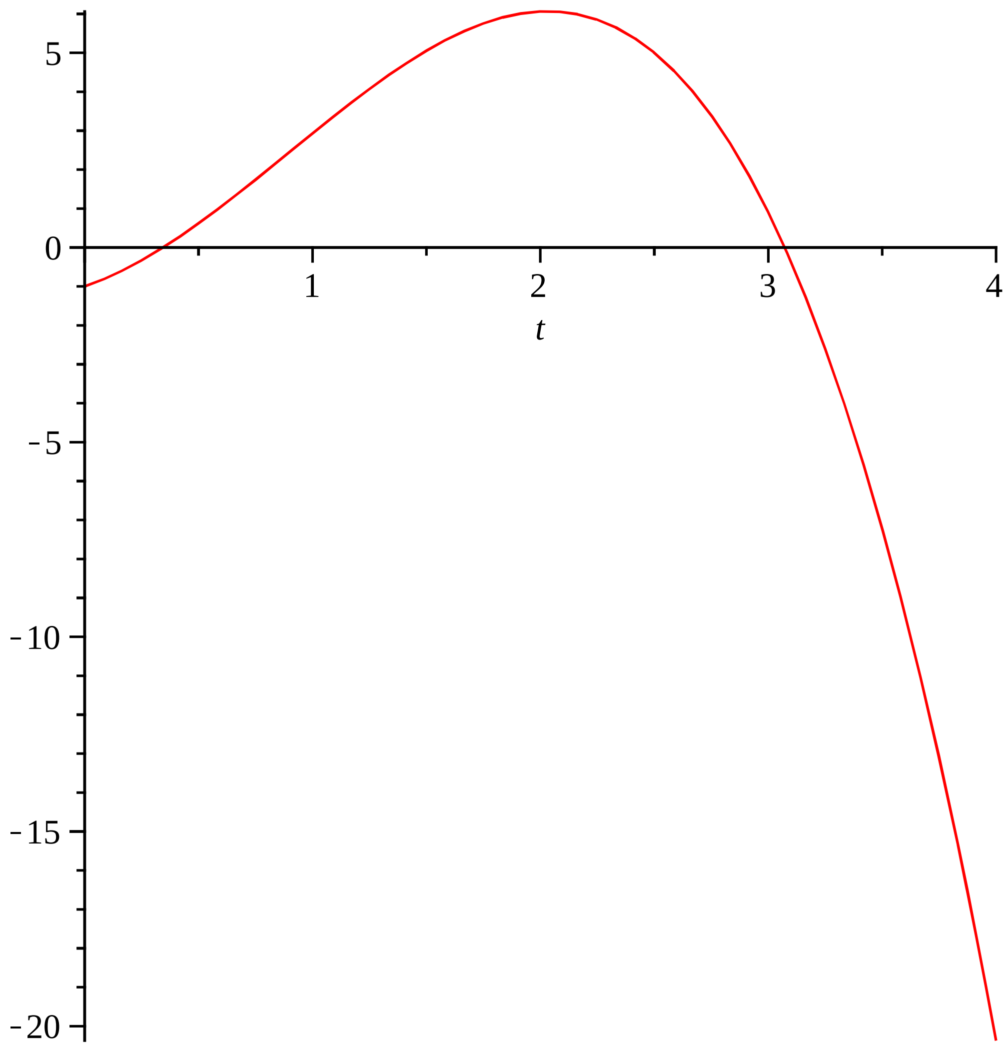
> *TLS* := *simplify*(*isolate*(*TLE*, *laplace*(*f*(*t*), *t*, *s*)))

$$TLS := laplace(f(t), t, s) = -\frac{(-8 - 8\,s + s^3)\,(s-1)}{s^4\,(1+s)} \quad \textbf{(3)}$$

> *Solucion* := *invlaplace*(*TLS*, *s*, *t*)

$$Solucion := f(t) = -\frac{4}{3}\,t^3 + 4\,t^2 + 1 - 2\,\mathrm{e}^{-t} \quad \textbf{(4)}$$

> *plot*(*rhs*(*Solucion*), *t* = 0 ..4)



> restart

> Ecuacion := diff(z(x, y), x$2) − 6·diff(z(x, y), y) = 0

$$Ecuacion := \frac{\partial^2}{\partial x^2} z(x, y) - 6 \left(\frac{\partial}{\partial y} z(x, y) \right) = 0 \qquad \textbf{(5)}$$

> SolUno := pdsolve(Ecuacion)

$$SolUno := (z(x, y) = \_F1(x)\ \_F2(y))\ \&\text{where} \left[\left\{ \frac{d^2}{dx^2} \_F1(x) = \_c_1\ \_F1(x), \frac{d}{dy} \_F2(y) = \frac{1}{6} \_c_1\ \_F2(y) \right\} \right] \qquad \textbf{(6)}$$

> with(PDEtools)

[CanonicalCoordinates, ChangeSymmetry, CharacteristicQ, CharacteristicQInvariants, ConservedCurrentTest, ConservedCurrents, ConsistencyTest, D_Dx, DeterminingPDE, Eta_k, Euler, FromJet, InfinitesimalGenerator, Infinitesimals, IntegratingFactorTest, IntegratingFactors, InvariantSolutions, InvariantTransformation, Invariants, Laplace, Library, PDEplot, PolynomialSolutions, ReducedForm, SimilaritySolutions, SimilarityTransformation, SymmetrySolutions, SymmetryTest, SymmetryTransformation, TWSolutions, ToJet, build, casesplit, charstrip, dchange, dcoeffs, declare, diff_table, **(7)**

$difforder, dpolyform, dsubs, mapde, separability, splitstrip, splitsys, undeclare]$

> $SolDos := build(SolUno)$

$$SolDos := z(x,y) = e^{\sqrt{\_c_1}\,x}\,\_C3\,e^{\frac{1}{6}\_c_1 y}\,\_C1 + \frac{\_C3\,e^{\frac{1}{6}\_c_1 y}\,\_C2}{e^{\sqrt{\_c_1}\,x}} \quad \textbf{(8)}$$

> $Ecuacion$

$$\frac{\partial^2}{\partial x^2} z(x,y) - 6\left(\frac{\partial}{\partial y} z(x,y)\right) = 0 \quad \textbf{(9)}$$

> $EcuacionDos := eval(subs(z(x,y) = F(x)\cdot G(y), Ecuacion))$

$$EcuacionDos := \left(\frac{d^2}{dx^2} F(x)\right) G(y) - 6\,F(x)\left(\frac{d}{dy} G(y)\right) = 0 \quad \textbf{(10)}$$

> $EcuacionTres := lhs(EcuacionDos) + 6\,F(x)\left(\frac{d}{dy} G(y)\right) = rhs(EcuacionDos) + 6\,F(x)\left(\frac{d}{dy} G(y)\right)$

$$EcuacionTres := \left(\frac{d^2}{dx^2} F(x)\right) G(y) = 6\,F(x)\left(\frac{d}{dy} G(y)\right) \quad \textbf{(11)}$$

> $EcuacionCuatro := \frac{lhs(EcuacionTres)}{6\cdot F(x)\cdot G(y)} = \frac{rhs(EcuacionTres)}{6\cdot F(x)\cdot G(y)}$

$$EcuacionCuatro := \frac{1}{6}\,\frac{\frac{d^2}{dx^2} F(x)}{F(x)} = \frac{\frac{d}{dy} G(y)}{G(y)} \quad \textbf{(12)}$$

> $EcuacionX := lhs(EcuacionCuatro) = \text{alpha}; EcuacionY := rhs(EcuacionCuatro) = \text{alpha}$

$$EcuacionX := \frac{1}{6}\,\frac{\frac{d^2}{dx^2} F(x)}{F(x)} = \alpha$$

$$EcuacionY := \frac{\frac{d}{dy} G(y)}{G(y)} = \alpha \quad \textbf{(13)}$$

> $SolXcero := dsolve(subs(\text{alpha} = 0, EcuacionX))$

$$SolXcero := F(x) = \_C1\,x + \_C2 \quad \textbf{(14)}$$

> $SolYcero := dsolve(subs(\text{alpha} = 0, EcuacionY))$

$$SolYcero := G(y) = \_C1 \quad \textbf{(15)}$$

> $SolucionCero := z(x,y) = rhs(SolXcero)\cdot subs(\_C1 = 1, rhs(SolYcero))$

$$SolucionCero := z(x,y) = \_C1\,x + \_C2 \quad \textbf{(16)}$$

> $SolXpos := dsolve(subs(\text{alpha} = \text{beta}\cdot\cdot 2, EcuacionX))$

$$SolXpos := F(x) = \_C1\,e^{\sqrt{6}\,\beta x} + \_C2\,e^{-\sqrt{6}\,\beta x} \quad \textbf{(17)}$$

> $SolYpos := dsolve(subs(\text{alpha} = \text{beta}\cdot\cdot 2, EcuacionY))$

$$SolYpos := G(y) = \_C1\,e^{\beta^2 y} \quad \textbf{(18)}$$

> $SolucionPos := z(x,y) = rhs(SolXpos)\cdot subs(\_C1 = 1, rhs(SolYpos))$

(19)

$$SolucionPos := z(x, y) = \left(\_C1\, e^{\sqrt{6}\,\beta x} + \_C2\, e^{-\sqrt{6}\,\beta x}\right) e^{\beta^2 y} \tag{19}$$

> $SolXneg := dsolve(subs(\text{alpha} = -\text{beta} \cdot \cdot 2, EcuacionX))$

$$SolXneg := F(x) = \_C1 \sin\left(\sqrt{6}\,\beta x\right) + \_C2 \cos\left(\sqrt{6}\,\beta x\right) \tag{20}$$

> $SolYneg := dsolve(subs(\text{alpha} = -\text{beta} \cdot \cdot 2, EcuacionY))$

$$SolYneg := G(y) = \_C1\, e^{-\beta^2 y} \tag{21}$$

> $SolucionNeg := z(x, y) = rhs(SolXneg) \cdot subs(\_C1 = 1, rhs(SolYneg))$

$$SolucionNeg := z(x, y) = \left(\_C1 \sin\left(\sqrt{6}\,\beta x\right) + \_C2 \cos\left(\sqrt{6}\,\beta x\right)\right) e^{-\beta^2 y} \tag{22}$$

>