

$$\begin{aligned} &> \text{restart} \\ &> \text{Ecuacion} := \text{diff}(y(x, t), x\$2) - 9 \cdot \text{diff}(y(x, t), t) = 0 \\ &\quad \text{Ecuacion} := \frac{\partial^2}{\partial x^2} y(x, t) - 9 \left( \frac{\partial}{\partial t} y(x, t) \right) = 0 \end{aligned} \quad (1)$$

$$\begin{aligned} &> \text{EcuacionSeparable} := \text{eval}(\text{subs}(y(x, t) = F(x) \cdot G(t), \text{Ecuacion})) \\ &\quad \text{EcuacionSeparable} := \left( \frac{d^2}{dx^2} F(x) \right) G(t) - 9 F(x) \left( \frac{d}{dt} G(t) \right) = 0 \end{aligned} \quad (2)$$

$$\begin{aligned} &> \text{EcuacionSeparada} := \frac{\left( \text{lhs}(\text{EcuacionSeparable}) + 9 F(x) \left( \frac{d}{dt} G(t) \right) \right)}{9 \cdot F(x) \cdot G(t)} \\ &\quad = \frac{\left( \text{rhs}(\text{EcuacionSeparable}) + 9 F(x) \left( \frac{d}{dt} G(t) \right) \right)}{9 \cdot F(x) \cdot G(t)} \\ &\quad \text{EcuacionSeparada} := \frac{1}{9} \frac{\frac{d^2}{dx^2} F(x)}{F(x)} = \frac{\frac{d}{dt} G(t)}{G(t)} \end{aligned} \quad (3)$$

$$\begin{aligned} &> \text{EcuacionX} := \text{lhs}(\text{EcuacionSeparada}) = \alpha \\ &\quad \text{EcuacionX} := \frac{1}{9} \frac{\frac{d^2}{dx^2} F(x)}{F(x)} = \alpha \end{aligned} \quad (4)$$

$$\begin{aligned} &> \text{EcuacionT} := \text{rhs}(\text{EcuacionSeparada}) = \alpha \\ &\quad \text{EcuacionT} := \frac{\frac{d}{dt} G(t)}{G(t)} = \alpha \end{aligned} \quad (5)$$

$$\begin{aligned} &> \text{SolucionXcero} := \text{dsolve}(\text{subs}(\alpha = 0, \text{EcuacionX})) \\ &\quad \text{SolucionXcero} := F(x) = \_C1 x + \_C2 \end{aligned} \quad (6)$$

$$\begin{aligned} &> \text{SolucionTcero} := \text{dsolve}(\text{subs}(\alpha = 0, \text{EcuacionT})) \\ &\quad \text{SolucionTcero} := G(t) = \_C1 \end{aligned} \quad (7)$$

$$\begin{aligned} &> \text{SolucionGeneralCero} := y(x, t) = \text{rhs}(\text{SolucionXcero}) \cdot \text{subs}(\_C1 = 1, \text{rhs}(\text{SolucionTcero})) \\ &\quad \text{SolucionGeneralCero} := y(x, t) = \_C1 x + \_C2 \end{aligned} \quad (8)$$

$$\begin{aligned} &> \text{SolucionXpos} := \text{dsolve}(\text{subs}(\alpha = \beta \cdot 2, \text{EcuacionX})) \\ &\quad \text{SolucionXpos} := F(x) = \_C1 e^{3\beta x} + \_C2 e^{-3\beta x} \end{aligned} \quad (9)$$

$$\begin{aligned} &> \text{SolucionTpos} := \text{dsolve}(\text{subs}(\alpha = \beta \cdot 2, \text{EcuacionT})) \\ &\quad \text{SolucionTpos} := G(t) = \_C1 e^{\beta^2 t} \end{aligned} \quad (10)$$

$$\begin{aligned} &> \text{SolucionGeneralPos} := y(x, t) = \text{rhs}(\text{SolucionXpos}) \cdot \text{subs}(\_C1 = 1, \text{rhs}(\text{SolucionTpos})) \\ &\quad \text{SolucionGeneralPos} := y(x, t) = (\_C1 e^{3\beta x} + \_C2 e^{-3\beta x}) e^{\beta^2 t} \end{aligned} \quad (11)$$

$$\begin{aligned} &> \text{SolucionXneg} := \text{dsolve}(\text{subs}(\alpha = -\beta \cdot 2, \text{EcuacionX})) \\ &\quad \text{SolucionXneg} := F(x) = \_C1 \sin(3\beta x) + \_C2 \cos(3\beta x) \end{aligned} \quad (12)$$

$$\begin{aligned} &> \text{SolucionTneg} := \text{dsolve}(\text{subs}(\alpha = -\beta \cdot 2, \text{EcuacionT})) \\ &\quad \text{SolucionTneg} := G(t) = \_C1 e^{-\beta^2 t} \end{aligned} \quad (13)$$

$$> \text{SolucionGeneralNeg} := y(x, t) = \text{rhs}(\text{SolucionXneg}) \cdot \text{subs}(\_C1 = 1, \text{rhs}(\text{SolucionTneg}))$$

$$\text{SolucionGeneralNeg} := y(x, t) = (\_C1 \sin(3 \beta x) + \_C2 \cos(3 \beta x)) e^{-\beta^2 t} \quad (14)$$

> 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, difforder, dpolyform, dsubs, mapde, separability, splitstrip, splitsys, undeclare] (15)

> SolucionGeneral := build(pdsolve(Ecuacion))

$$\text{SolucionGeneral} := y(x, t) = e^{\sqrt{-c_1} x} \_C3 e^{\frac{1}{9} - c_1 t} \_C1 + \frac{-C3 e^{\frac{1}{9} - c_1 t} \_C2}{e^{\sqrt{-c_1} x}} \quad (16)$$

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