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> restart
> Sistema := diff(x[1](t), t) = -7*x[1](t) + x[2](t) + 5, diff(x[2](t), t) = -2*x[1](t) - 5
    ·x[2](t) - 37·t : Sistema[1]; Sistema[2]

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$$\frac{d}{dt} x_1(t) = -7 x_1(t) + x_2(t) + 5$$

$$\frac{d}{dt} x_2(t) = -2 x_1(t) - 5 x_2(t) - 37 t \quad (1)$$

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> CondIni := x[1](0) = 0, x[2](0) = 0

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$$CondIni := x_1(0) = 0, x_2(0) = 0 \quad (2)$$

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> Var[2] := isolate(Sistema[1], x[2](t))

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$$Var_2 := x_2(t) = \frac{d}{dt} x_1(t) + 7 x_1(t) - 5 \quad (3)$$

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> Ecua := eval(subs(x[2](t) = rhs(Var[2]), Sistema[2]))

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$$Ecua := \frac{d^2}{dt^2} x_1(t) + 7 \frac{d}{dt} x_1(t) = -37 x_1(t) - 5 \frac{d}{dt} x_1(t) + 25 - 37 t \quad (4)$$

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> EcuaDos := lhs(Ecua) - (-37 x_1(t) - 5 \frac{d}{dt} x_1(t)) = rhs(Ecua) - (-37 x_1(t) - 5 \frac{d}{dt}
    x_1(t))

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$$EcuaDos := \frac{d^2}{dt^2} x_1(t) + 12 \frac{d}{dt} x_1(t) + 37 x_1(t) = 25 - 37 t \quad (5)$$

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> EcuaDosHom := lhs(EcuaDos) = 0

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$$EcuaDosHom := \frac{d^2}{dt^2} x_1(t) + 12 \frac{d}{dt} x_1(t) + 37 x_1(t) = 0 \quad (6)$$

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> Q := rhs(EcuaDos)

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$$Q := 25 - 37 t \quad (7)$$

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> EcuaCarac := m^2 + 12·m + 37 = 0

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$$EcuaCarac := m^2 + 12 m + 37 = 0 \quad (8)$$

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> Raiz := solve(EcuaCarac)

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$$Raiz := -6 + I, -6 - I \quad (9)$$

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> xI[1] := exp(Re(Raiz[1])·t)·cos(Im(Raiz[1])·t); xI[2] := exp(Re(Raiz[1])·t)
    ·sin(Im(Raiz[1])·t)

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$$xI_1 := e^{-6t} \cos(t)$$

$$xI_2 := e^{-6t} \sin(t) \quad (10)$$

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> with(linalg) :
> WW := wronskian([xI[1], xI[2]], t)

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$$WW := \begin{bmatrix} e^{-6t} \cos(t) & e^{-6t} \sin(t) \\ -6 e^{-6t} \cos(t) - e^{-6t} \sin(t) & -6 e^{-6t} \sin(t) + e^{-6t} \cos(t) \end{bmatrix} \quad (11)$$

$$\begin{aligned} &> BB := \text{array}([0, Q]) \\ &BB := \begin{bmatrix} 0 & 25 - 37t \end{bmatrix} \end{aligned} \quad (12)$$

$$\begin{aligned} &> ParaVar := \text{simplify}(\text{linsolve}(WW, BB)) \\ &ParaVar := \begin{bmatrix} e^{6t} (37t - 25) \sin(t) & (25 - 37t) \cos(t) e^{6t} \end{bmatrix} \end{aligned} \quad (13)$$

$$\begin{aligned} &> Aprima := ParaVar[1]; Bprima := ParaVar[2] \\ &Aprima := e^{6t} (37t - 25) \sin(t) \\ &Bprima := (25 - 37t) \cos(t) e^{6t} \end{aligned} \quad (14)$$

$$\begin{aligned} &> SolGralUno := x[1](t) = \text{simplify}((\text{int}(Aprima, t) + _C1) \cdot xI[1] + (\text{int}(Bprima, t) + _C2) \cdot xI[2]) \\ &SolGralUno := x_1(t) = \cos(t) e^{-6t} _C1 + \sin(t) e^{-6t} _C2 - t + 1 \end{aligned} \quad (15)$$

$$\begin{aligned} &> SolGralDos := x[2](t) = \text{simplify}(\text{eval}(\text{subs}(x[1](t) = \text{rhs}(SolGralUno), \text{rhs}(Var[2])))) \\ &SolGralDos := x_2(t) = ((_C1 + _C2) \cos(t) - \sin(t) (_C1 - _C2)) e^{-6t} - 7t + 1 \end{aligned} \quad (16)$$

$$\begin{aligned} &> ComprobarUno := \text{simplify}(\text{eval}(\text{subs}(x[1](t) = \text{rhs}(SolGralUno), x[2](t) \\ &= \text{rhs}(SolGralDos), \text{lhs}(Sistema[1]) - \text{rhs}(Sistema[1]) = 0))) \\ &ComprobarUno := 0 = 0 \end{aligned} \quad (17)$$

$$\begin{aligned} &> ComprobarDos := \text{simplify}(\text{eval}(\text{subs}(x[1](t) = \text{rhs}(SolGralUno), x[2](t) = \text{rhs}(SolGralDos), \\ &\text{lhs}(Sistema[2]) - \text{rhs}(Sistema[2]) = 0))) \\ &ComprobarDos := 0 = 0 \end{aligned} \quad (18)$$

$$\begin{aligned} &> SistUno := \text{simplify}(\text{subs}(t=0, \text{rhs}(SolGralUno) = 0)) \\ &SistUno := _C1 + 1 = 0 \end{aligned} \quad (19)$$

$$\begin{aligned} &> SistDos := \text{simplify}(\text{subs}(t=0, \text{rhs}(SolGralDos) = 0)) \\ &SistDos := _C1 + _C2 + 1 = 0 \end{aligned} \quad (20)$$

$$\begin{aligned} &> Para := \text{solve}([SistUno, SistDos]) \\ &Para := \{ _C1 = -1, _C2 = 0 \} \end{aligned} \quad (21)$$

$$\begin{aligned} &> SolPartUno := \text{subs}(_C1 = \text{rhs}(Para[1]), _C2 = \text{rhs}(Para[2]), SolGralUno) \\ &SolPartUno := x_1(t) = -e^{-6t} \cos(t) + 1 - t \end{aligned} \quad (22)$$

$$\begin{aligned} &> SolPartDos := \text{subs}(_C1 = \text{rhs}(Para[1]), _C2 = \text{rhs}(Para[2]), SolGralDos) \\ &SolPartDos := x_2(t) = (-\cos(t) + \sin(t)) e^{-6t} - 7t + 1 \end{aligned} \quad (23)$$

$$\begin{aligned} &> ComprobarTres := \text{simplify}(\text{eval}(\text{subs}(x[1](t) = \text{rhs}(SolPartUno), x[2](t) = \text{rhs}(SolPartDos), \\ &\text{lhs}(Sistema[1]) - \text{rhs}(Sistema[1]) = 0))) \\ &ComprobarTres := 0 = 0 \end{aligned} \quad (24)$$

$$\begin{aligned} &> ComprobarCuatro := \text{simplify}(\text{eval}(\text{subs}(x[1](t) = \text{rhs}(SolPartUno), x[2](t) \\ &= \text{rhs}(SolPartDos), \text{lhs}(Sistema[2]) - \text{rhs}(Sistema[2]) = 0))) \\ &ComprobarDos := 0 = 0 \end{aligned} \quad (25)$$

$$\begin{aligned} &> ComprobarCinco := \text{simplify}(\text{subs}(t=0, SolPartUno)) \\ &ComprobarCinco := x_1(0) = 0 \end{aligned} \quad (26)$$

$$\begin{aligned} &> ComprobarSeis := \text{simplify}(\text{subs}(t=0, SolPartDos)) \\ &ComprobarSeis := x_2(0) = 0 \end{aligned} \quad (27)$$

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> CondIni
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$$x_1(0) = 0, x_2(0) = 0 \quad (28)$$

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> with(DEtools) :
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> restart
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> AA := array([[-7, 1], [-2, -5]])
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$$AA := \begin{bmatrix} -7 & 1 \\ -2 & -5 \end{bmatrix} \quad (29)$$

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> with(linalg) :
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> MatExp := exponential(AA, t)
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$$MatExp := \begin{bmatrix} e^{-6t} \cos(t) - e^{-6t} \sin(t) & e^{-6t} \sin(t) \\ -2 e^{-6t} \sin(t) & e^{-6t} \cos(t) + e^{-6t} \sin(t) \end{bmatrix} \quad (30)$$

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> SolHom := evalm(MatExp &* [_C1, _C2])
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$$SolHom := [(e^{-6t} \cos(t) - e^{-6t} \sin(t)) _C1 + e^{-6t} \sin(t) _C2, -2 e^{-6t} \sin(t) _C1 + (e^{-6t} \cos(t) + e^{-6t} \sin(t)) _C2] \quad (31)$$

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> SolHomPartUno := x[1](t) = simplify(SolHom[1])
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$$SolHomPartUno := x_1(t) = ((-_C1 + _C2) \sin(t) + \cos(t) _C1) e^{-6t} \quad (32)$$

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> SolHomPartDos := x[2](t) = simplify(SolHom[2])
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$$SolHomPartDos := x_2(t) = e^{-6t} (\cos(t) _C2 - 2 \sin(t) _C1 + \sin(t) _C2) \quad (33)$$

```
> ComprobarUno := simplify(subs(t=0, SolHomPartUno))
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$$ComprobarUno := x_1(0) = _C1 \quad (34)$$

```
> ComprobarDos := simplify(subs(t=0, SolHomPartDos))
```

$$ComprobarDos := x_2(0) = _C2 \quad (35)$$

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>
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