

```
> restart
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>
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$$\underbrace{(y^2 + x y^2)}_N \frac{dy}{dx} + \underbrace{x^2 - y x^2}_M = 0$$

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> Ecuacion := (y(x)·2 + x·y(x)·2)·diff(y(x), x) + x·2 - y(x)·x·2 = 0
```

$$Ecuacion := (y(x)^2 + x y(x)^2) \left( \frac{d}{dx} y(x) \right) + x^2 - y(x) x^2 = 0 \quad (1)$$

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> with(DEtools)
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[AreSimilar, DENormal, DEplot, DEplot3d, DEplot_polygon, DFactor, DFactorLCLM, (2)
```

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DFactorsols, Dchangevar, FunctionDecomposition, GCRD, Gosper, Heunsols,
Homomorphisms, IVPsol, IsHyperexponential, LCLM, MeijerGsols,
MultiplicativeDecomposition, ODEInvariants, PDEchangecoords, PolynomialNormalForm,
RationalCanonicalForm, ReduceHyperexp, RiemannPsols, Xchange, Xcommutator, Xgauge,
Zeilberger, abelsol, adjoint, autonomous, bernoullisol, buildsol, buildsym, canoni, caseplot,
casesplit, checkrank, chinisol, clairautsol, constcoeffsols, convertAlg, convertsys,
dalembertsol, dcoeffs, de2diffop, dfieldplot, diff_table, diffop2de, dperiodic_sols, dpolyform,
dsols, eigenring, endomorphism_charpoly, equinv, eta_k, eulersols, exactsol, expsols,
exterior_power, firint, firtest, formal_sol, gen_exp, generate_ic, genhomosol, gensys,
hamilton_eqs, hypergeomsols, hyperode, indicialeq, infgen, initialdata, integrate_sols,
intfactor, invariants, kovacicols, leftdivision, liesol, line_int, linearsol, matrixDE,
matrix_riccati, maxdimsystems, moser_reduce, muchange, mult, mutest, newton_polygon,
normalG2, ode_int_y, ode_y1, odeadvisor, odepde, parametricsol, particularsol,
phaseportrait, poincare, polysols, power_equivalent, rational_equivalent, ratsols, redode,
reduceOrder, reduce_order, regular_parts, regularsp, remove_RootOf, riccati_system,
riccatisol, rifread, rifsimp, rightdivision, rtaylor, separablesol, singularities, solve_group,
super_reduce, symgen, symmetric_power, symmetric_product, symtest, transinv, translate,
untranslate, varparam, zoom]
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> odeadvisor(Ecuacion)
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[_separable] (3)
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```
> Ecuacion
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$$(y(x)^2 + x y(x)^2) \left( \frac{d}{dx} y(x) \right) + x^2 - y(x) x^2 = 0 \quad (4)$$

```
> M := x^2 - y·x^2
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$$M := x^2 - y x^2 \quad (5)$$

$$\begin{aligned} &> N := y^2 + x \cdot y^2 \\ &N := y^2 + x y^2 \end{aligned} \quad (6)$$

$$\begin{aligned} &> \text{factor}(M) \\ &-x^2 (-1 + y) \end{aligned} \quad (7)$$

$$\begin{aligned} &> \text{factor}(N) \\ &y^2 (1 + x) \end{aligned} \quad (8)$$

$$\begin{aligned} &> P := -x \cdot 2; Q := -1 + y; R := 1 + x; S := y \cdot 2 \\ &P := -x^2 \\ &Q := -1 + y \\ &R := 1 + x \\ &S := y^2 \end{aligned} \quad (9)$$

$$\begin{aligned} &> \text{SolucionGeneral} := \int \left( \frac{P}{R}, x \right) + \int \left( \frac{S}{Q}, y \right) = C_1 \\ &\text{SolucionGeneral} := -\frac{1}{2} x^2 + x - \ln(1 + x) + y + \frac{1}{2} y^2 + \ln(-1 + y) = C_1 \end{aligned} \quad (10)$$

$$\begin{aligned} &> \text{SolucionDos} := \text{simplify}(\exp(\text{lhs}(\text{SolucionGeneral}))) = C_1 \\ &\text{SolucionDos} := \frac{(-1 + y) e^{-\frac{1}{2} (x + y) (x - 2 - y)}}{1 + x} = C_1 \end{aligned} \quad (11)$$

$$\begin{aligned} &> \text{SolucionTres} := \text{lhs}(\text{SolucionDos}) \cdot \left( \frac{(1 + x)}{(-1 + y)} \right) = \text{rhs}(\text{SolucionDos}) \cdot \left( \frac{(1 + x)}{(-1 + y)} \right) \\ &\text{SolucionTres} := e^{-\frac{1}{2} (x + y) (x - 2 - y)} = \frac{C_1 (1 + x)}{-1 + y} \end{aligned} \quad (12)$$

$$\begin{aligned} &> \text{SolucionFinal} := -\frac{1}{2} x^2 + x - \ln(1 + x) + y(x) + \frac{1}{2} y(x)^2 + \ln(-1 + y(x)) = C_1 \\ &\text{SolucionFinal} := -\frac{1}{2} x^2 + x - \ln(1 + x) + y(x) + \frac{1}{2} y(x)^2 + \ln(-1 + y(x)) = C_1 \end{aligned} \quad (13)$$

$$\begin{aligned} &> \text{DerivadaSolGral} := \text{diff}(\text{SolucionFinal}, x) \\ &\text{DerivadaSolGral} := -x + 1 - \frac{1}{1 + x} + \frac{d}{dx} y(x) + y(x) \left( \frac{d}{dx} y(x) \right) + \frac{\frac{d}{dx} y(x)}{-1 + y(x)} = 0 \end{aligned} \quad (14)$$

$$\begin{aligned} &> \text{DespejadaDerivada} := \text{simplify}(\text{isolate}(\text{DerivadaSolGral}, \text{diff}(y(x), x))) \\ &\text{DespejadaDerivada} := \frac{d}{dx} y(x) = \frac{x^2 (-1 + y(x))}{(1 + x) y(x)^2} \end{aligned} \quad (15)$$

$$\begin{aligned} &> \text{DespejadaEcuacion} := \text{simplify}(\text{isolate}(\text{Ecuacion}, \text{diff}(y(x), x))) \\ &\text{DespejadaEcuacion} := \frac{d}{dx} y(x) = \frac{x^2 (-1 + y(x))}{(1 + x) y(x)^2} \end{aligned} \quad (16)$$

$$\begin{aligned} &> \text{Comprobacion} := \text{rhs}(\text{DespejadaDerivada}) - \text{rhs}(\text{DespejadaEcuacion}) = 0 \\ &\text{Comprobacion} := 0 = 0 \end{aligned} \quad (17)$$

$$\begin{aligned} &> \text{isolate}(\text{SolucionFinal}, y(x)) \end{aligned} \quad (18)$$



$$y(x) = e^{\text{RootOf}\left(2\_Z + 4e^{-Z} + 3 + (e^{-Z})^2 - 2C_1 - x^2 + 2x - 2\ln(1+x)\right)} + 1$$

(18)