

> restart

$$(y^2 + xy^2) y' + x^2 - yx^2 = 0.$$

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

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

> with(DEtools);

[AreSimilar, DENormal, DEplot, DEplot3d, DEplot\_polygon, DFactor, DFactorLCLM, (2)

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, dsubs, 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, kovacicsols, 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]

> odeadvisor(Ecuacion)

[\_separable] (3)

> FactInt := intfactor(Ecuacion)

$$FactInt := \frac{1}{(-1 + y(x)) (1 + x)} \quad (4)$$

> Ecuacion;

$$(y(x)^2 + x y(x)^2) \left( \frac{d}{dx} y(x) \right) + x^2 - y(x) x^2 = 0 \quad (5)$$

> M(x, y) := x^2 - y·x^2; N(x, y) := y^2 + x·y^2

$$M(x, y) := x^2 - y x^2$$

$$N(x, y) := y^2 + x y^2 \quad (6)$$

> factor(M(x, y));

$$-x^2 (-1 + y)$$

(7)

> factor(N(x, y));

$$y^2 (1 + x)$$

(8)

> P(x) := -x·2; Q(y) := (-1 + y); R(x) := 1 + x; S(y) := y·2;

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

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

$$\begin{aligned}
 &> \text{Ecuacion}; \\
 &\quad (y(x)^2 + x y(x)^2) \left( \frac{d}{dx} y(x) \right) + x^2 - y(x) x^2 = 0
 \end{aligned} \tag{11}$$

$$\begin{aligned}
 &> \text{SolGral} := \text{dsolve}(\text{Ecuacion}) \\
 &\text{SolGral} := y(x) = \left( e^{\text{RootOf}(2\_Z e^2\_Z + x^2 e^2\_Z - 2x e^2\_Z - 3 e^2\_Z - 4 e^Z - 4 e^Z x - 1 - 2x - x^2 + 2\_CI e^2\_Z)} \right. \\
 &\quad \left. + 1 + x \right) e^{-\text{RootOf}(2\_Z e^2\_Z + x^2 e^2\_Z - 2x e^2\_Z - 3 e^2\_Z - 4 e^Z - 4 e^Z x - 1 - 2x - x^2 + 2\_CI e^2\_Z)}
 \end{aligned} \tag{12}$$

$$\begin{aligned}
 &> \text{separablesol}(\text{Ecuacion}) \\
 &\{y(x) = \left( e^{\text{RootOf}(2\_Z e^2\_Z + x^2 e^2\_Z - 2x e^2\_Z - 3 e^2\_Z - 4 e^Z - 4 e^Z x - 1 - 2x - x^2 + 2\_CI e^2\_Z)} + 1 \right. \\
 &\quad \left. + x \right) e^{-\text{RootOf}(2\_Z e^2\_Z + x^2 e^2\_Z - 2x e^2\_Z - 3 e^2\_Z - 4 e^Z - 4 e^Z x - 1 - 2x - x^2 + 2\_CI e^2\_Z)}\}
 \end{aligned} \tag{13}$$

$$\begin{aligned}
 &> \text{SolucionGeneral}; \\
 &\quad -\frac{1}{2} x^2 + x - \ln(1 + x) + y + \frac{1}{2} y^2 + \ln(-1 + y) = CI
 \end{aligned} \tag{14}$$

$$\begin{aligned}
 &> \text{SOLU} := -\frac{1}{2} x^2 + x - \ln(1 + x) + y(x) + \frac{1}{2} y(x)^2 + \ln(-1 + y(x)) = CI \\
 &\quad \text{SOLU} := -\frac{1}{2} x^2 + x - \ln(1 + x) + y(x) + \frac{1}{2} y(x)^2 + \ln(-1 + y(x)) = CI
 \end{aligned} \tag{15}$$

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

$$\begin{aligned}
 &> \text{Ecuacion}; \\
 &\quad (y(x)^2 + x y(x)^2) \left( \frac{d}{dx} y(x) \right) + x^2 - y(x) x^2 = 0
 \end{aligned} \tag{17}$$

$$\begin{aligned}
 &> \text{Deri} := \text{isolate}(\text{Ecuacion}, \text{diff}(y(x), x)) \\
 &\quad \text{Deri} := \frac{d}{dx} y(x) = \frac{-x^2 + y(x) x^2}{y(x)^2 + x y(x)^2}
 \end{aligned} \tag{18}$$

$$\begin{aligned}
 &> \text{comprobacion} := \text{simplify}(\text{rhs}(\text{DerivadaIncognita}) - \text{rhs}(\text{Deri})) = 0 \\
 &\quad \text{comprobacion} := 0 = 0
 \end{aligned} \tag{19}$$

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