> *restart*

> $EcuaDif := (x\cdot y(x)\cdot\cdot 2 - y(x)\cdot\cdot 2 + x - 1) + (x\cdot\cdot 2\cdot y(x) - 2\cdot x\cdot y(x) + x\cdot\cdot 2 + 2\cdot y(x) - 2\cdot x + 2)\cdot diff(y(x), x) = 0$

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

> $SolGral := dsolve(EcuaDif)$

$$SolGral := y(x) = \tan\left(RootOf\left(2\_Z + \ln\left(x^2 - 2\,x + 2\right) + \ln\left(\frac{2}{\cos(2\_Z) + 1}\right) + 2\_C1\right)\right) \quad (2)$$

ESTA SOLUCIÓN GENERAL, NO PUEDE SER ÚTIL PORQUE LA VARIABLE INDPENDIENTE ES COMPLEJA (_Z)

> *with(DEtools)*

[*AreSimilar, Closure, DEnormal, DEplot, DEplot3d, DEplot_polygon, DFactor, DFactorLCLM, DFactorsols, Dchangevar, Desingularize, 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*] **(3)**

> $Tipo := odeadvisor(EcuaDif)$

$$Tipo := [\_separable] \quad (4)$$

> $M := factor(x\,y^2 - y^2 + x - 1)$

$$M := \left(y^2 + 1\right)\,(x - 1) \quad (5)$$

> $N := factor(x^2\,y - 2\,x\,y + x^2 + 2\,y - 2\,x + 2)$

$$N := \left(x^2 - 2\,x + 2\right)\,(y + 1) \quad (6)$$

> $P := (x - 1); Q := \left(y^2 + 1\right); R := \left(x^2 - 2\,x + 2\right); S := (y + 1)$

$$P := x - 1$$
$$Q := y^2 + 1$$
$$R := x^2 - 2\,x + 2$$
$$S := y + 1 \quad (7)$$

> $SolGralDos := int\left(\frac{P}{R}, x\right) + int\left(\frac{S}{Q}, y\right) = C[1]$

$$SolGralDos := \frac{1}{2}\ln\left(x^2 - 2x + 2\right) + \frac{1}{2}\ln\left(y^2 + 1\right) + \arctan(y) = C_1 \tag{8}$$

> $SolGral$

$$y(x) = \tan\left(RootOf\left(2\_Z + \ln\left(x^2 - 2x + 2\right) + \ln\left(\frac{2}{\cos(2\_Z) + 1}\right) + 2\_C1\right)\right) \tag{9}$$

> $SolGralTres := \frac{1}{2}\ln\left(x^2 - 2x + 2\right) + \frac{1}{2}\ln\left(y(x)^2 + 1\right) + \arctan(y(x)) = C_1$

$$SolGralTres := \frac{1}{2}\ln\left(x^2 - 2x + 2\right) + \frac{1}{2}\ln\left(y(x)^2 + 1\right) + \arctan(y(x)) = C_1 \tag{10}$$

> $DerivSolGral := diff(SolGralTres, x)$

$$DerivSolGral := \frac{1}{2}\frac{2x - 2}{x^2 - 2x + 2} + \frac{y(x)\left(\frac{d}{dx}y(x)\right)}{y(x)^2 + 1} + \frac{\frac{d}{dx}y(x)}{y(x)^2 + 1} = 0 \tag{11}$$

> $EcuaDif$

$$x\,y(x)^2 - y(x)^2 + x - 1 + \left(x^2 y(x) - 2x\,y(x) + x^2 + 2y(x) - 2x + 2\right)\left(\frac{d}{dx}y(x)\right) = 0 \tag{12}$$

> $DerSolDesp := simplify(isolate(DerivSolGral, diff(y(x), x)))$

$$DerSolDesp := \frac{d}{dx}y(x) = -\frac{(x-1)\left(y(x)^2 + 1\right)}{\left(x^2 - 2x + 2\right)(y(x) + 1)} \tag{13}$$

> $DerEcuaDifDesp := simplify(isolate(EcuaDif, diff(y(x), x)))$

$$DerEcuaDifDesp := \frac{d}{dx}y(x) = -\frac{x\,y(x)^2 - y(x)^2 + x - 1}{x^2 y(x) - 2x\,y(x) + x^2 + 2y(x) - 2x + 2} \tag{14}$$

> $Comprobar := simplify(rhs(DerSolDesp) - rhs(DerEcuaDifDesp)) = 0$

$$Comprobar := 0 = 0 \tag{15}$$

> $restart$

> $Ecua := \exp(y(x))\cdot(1 + x\cdot\cdot 2)\cdot diff(y(x), x) - 2\cdot x\cdot(1 + \exp(y(x))) = 0$

$$Ecua := e^{y(x)}\left(x^2 + 1\right)\left(\frac{d}{dx}y(x)\right) - 2x\left(1 + e^{y(x)}\right) = 0 \tag{16}$$

> $with(DEtools):$

> $Tipo := odeadvisor(Ecua)$

$$Tipo := [\_separable] \tag{17}$$

> $M := -2x\left(1 + e^y\right)$

$$M := -2x\left(1 + e^y\right) \tag{18}$$

> $N := e^y\left(x^2 + 1\right)$

$$N := e^y\left(x^2 + 1\right) \tag{19}$$

> $P := -2x; Q := \left(1 + e^y\right); R := \left(x^2 + 1\right); S := e^y$

$$P := -2x$$

$$Q := 1 + e^y$$

$$R := x^2 + 1$$

$$S := e^y \tag{20}$$

> $SolGral := int\left(\frac{P}{R}, x\right) + int\left(\frac{S}{Q}, y\right) = C[1]$

$$SolGral := -\ln(x^2+1) + \ln(1+e^y) = C_1 \quad \textbf{(21)}$$

OJO: EN ESTA SOLUCIÓN GENERAL SE PUEDE DESPEJAR LA INCÓGNITA

> $SolGralDos := isolate(SolGral, y)$

$$SolGralDos := y = \ln\left(e^{C_1} x^2 + e^{C_1} - 1\right) \quad \textbf{(22)}$$

> $SolGralTres := dsolve(Ecua)$

$$SolGralTres := y(x) = \ln(\_C1\, x^2 + \_C1 - 1) \quad \textbf{(23)}$$

> $Ecua$

$$e^{y(x)} (x^2+1) \left(\frac{d}{dx} y(x)\right) - 2x\,(1+e^{y(x)}) = 0 \quad \textbf{(24)}$$

> $Comprobacion := simplify(eval(subs(y(x) = rhs(SolGralDos), Ecua)))$

$$Comprobacion := 0 = 0 \quad \textbf{(25)}$$

> $restart$

> $Ecua := (x \cdot\cdot 3 + y(x) \cdot\cdot 2 \cdot x) + (x \cdot\cdot 2 \cdot y(x) + y(x) \cdot\cdot 3) \cdot diff(y(x), x) = 0$

$$Ecua := x^3 + y(x)^2 x + (x^2 y(x) + y(x)^3) \left(\frac{d}{dx} y(x)\right) = 0 \quad \textbf{(26)}$$

> $with(DEtools):$

> $TIPO := odeadvisor(Ecua)$

$$TIPO := [\_separable] \quad \textbf{(27)}$$

> $SolGral := exactsol(Ecua)$

$$SolGral := \left\{y(x) = \sqrt{-x^2 - 2\,\_C1},\ y(x) = \sqrt{-x^2 + 2\,\_C1},\ y(x) = -\sqrt{-x^2 - 2\,\_C1},\ y(x) = -\sqrt{-x^2 + 2\,\_C1}\right\} \quad \textbf{(28)}$$

> $M := (x \cdot\cdot 3 + y \cdot\cdot 2 \cdot x)$

$$M := x^3 + x y^2 \quad \textbf{(29)}$$

> $N := x^2 y + y^3$

$$N := x^2 y + y^3 \quad \textbf{(30)}$$

> $CompExact := diff(M, y) = diff(N, x)$

$$CompExact := 2xy = 2xy \quad \textbf{(31)}$$

ES UNA ECUACIÓN DIFERENCIAL ORDINARIA PRIMER ORDEN NO-LINEAL (EXACTA)

> $IntM := int(M, x)$

$$IntM := \frac{1}{4} x^4 + \frac{1}{2} x^2 y^2 \quad \textbf{(32)}$$

> $SolGral := IntM + int(N - diff(IntM, y), y) = C[1]$

$$SolGral := \frac{1}{4} x^4 + \frac{1}{2} x^2 y^2 + \frac{1}{4} y^4 = C_1 \quad \textbf{(33)}$$

>

>