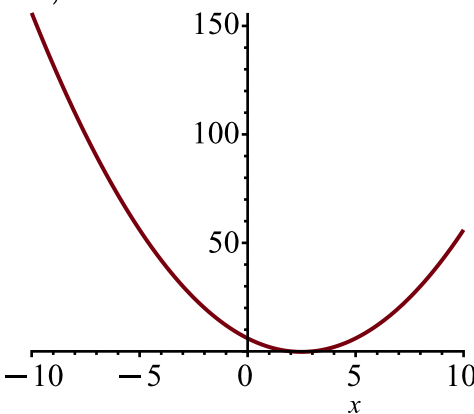


```

> restart
> Ecuacion := x^2 - 5·x + 6 = 0
Ecuacion := x^2 - 5 x + 6 = 0 (1)
> plot(lhs(Ecuacion), x = -10..10)

> rhs(Ecuacion)
0 (2)
> Raiz := solve(Ecuacion)
Raiz := 3, 2 (3)
> Ecuacion
x^2 - 5 x + 6 = 0 (4)
> EcuacionOriginal := expand((x - Raiz[1]) · (x - Raiz[2])) = 0
EcuacionOriginal := x^2 - 5 x + 6 = 0 (5)
> Comprobar := simplify(lhs(Ecuacion) - lhs(EcuacionOriginal)) = 0
Comprobar := 0 = 0 (6)
> DiaSemana := lunes, martes, miércoles, jueves, viernes, sábado, domingo
DiaSemana := lunes, martes, miércoles, jueves, viernes, sábado, domingo (7)
> DiaHabil := DiaSemana[1..5]
DiaHabil := lunes, martes, miércoles, jueves, viernes (8)
> FinDeSemana := DiaSemana[6..7]
FinDeSemana := sábado, domingo (9)
> DiaSemana[7]
domingo (10)
> DiaSemana[2]
martes (11)
> Expresion := Int(x^2 + 5 x, x) = int(x^2 + 5 x, x)
Expresion := ∫ (x^2 + 5 x) dx = 1/3 x^3 + 5/2 x^2 (12)
> Derivacion := Diff(lhs(Ecuacion), x) = diff(lhs(Ecuacion), x)
Derivacion := d/dx (x^2 - 5 x + 6) = 2 x - 5 (13)

```

```

> restart
> evalf(pi)
                                      $\pi$  (14)
=
> evalf(Pi)
                                      $\Pi$  (15)
=
> evalf(Pi)
                                3.141592654 (16)
=
> Digits := 20
                                Digits := 20 (17)
=
> evalf(Pi)
                                3.1415926535897932385 (18)
=
> evalf(exp(1))
                                2.7182818284590452354 (19)
=
> restart
> evalf(Pi)
                                3.141592654 (20)
=
> evalf(Pi, 500)
3.14159265358979323846264338327950288419716939937510582097494459230781640628620\ (21)
899862803482534211706798214808651328230664709384460955058223172535940812848\
111745028410270193852110555964462294895493038196442881097566593344612847564\
823378678316527120190914564856692346034861045432664821339360726024914127372\
458700660631558817488152092096282925409171536436789259036001133053054882046\
652138414695194151160943305727036575959195309218611738193261179310511854807\
44623799627495673518857527248912279381830119491
=
> evalf(Pi, 10000) :
> evalf(exp(1), 10000) :
> restart
> with(linalg)
[BlockDiagonal, GramSchmidt, JordanBlock, LUdecomp, QRdecomp, Wronskian, addcol, (22)
addrow, adj, adjoint, angle, augment, backsub, band, basis, bezout, blockmatrix, charmat,
charpoly, cholesky, col, coldim, colspace, colspan, companion, concat, cond, copyinto,
crossprod, curl, definite, delcols, delrows, det, diag, diverge, dotprod, eigenvals, eigenvalues,
eigenvectors, eigenvects, entermatrix, equal, exponential, extend, ffgausselim, fibonacci,
forwardsub, frobenius, gausselim, gaussjord, geneqns, genmatrix, grad, hadamard, hermite,
hessian, hilbert, htranspose, ihermite, indexfunc, innerprod, intbasis, inverse, ismith, issimilar,
iszero, jacobian, jordan, kernel, laplacian, leastsqrs, linsolve, matadd, matrix, minor, minpoly,
mulcol, mulrow, multiply, norm, normalize, nullspace, orthog, permanent, pivot, potential,
randmatrix, randvector, rank, ratform, row, rowdim, rowspace, rowspan, rref, scalarmul,
singularvals, smith, stackmatrix, submatrix, subvector, sumbasis, swapcol, swaprow, sylvester,

```

toeplitz, trace, transpose, vandermonde, vecpotent, vectdim, vector, wronskian]

> *Matriz* := array([[1, 2, 3], [4, -5, 6], [7, 8, 9]])

$$\text{Matriz} := \begin{bmatrix} 1 & 2 & 3 \\ 4 & -5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \quad (23)$$

> *Detreminante* := det(*Matriz*)

$$\text{Detreminante} := 120 \quad (24)$$

> *Inversa* := inverse(*Matriz*)

$$\text{Inversa} := \begin{bmatrix} -\frac{31}{40} & \frac{1}{20} & \frac{9}{40} \\ \frac{1}{20} & -\frac{1}{10} & \frac{1}{20} \\ \frac{67}{120} & \frac{1}{20} & -\frac{13}{120} \end{bmatrix} \quad (25)$$

> *Identidad* := evalm(*Matriz* &* *Inversa*)

$$\text{Identidad} := \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad (26)$$

> *Raro* := evalm(*Matriz* · 2)

$$\text{Raro} := \begin{bmatrix} 2 & 4 & 6 \\ 8 & -10 & 12 \\ 14 & 16 & 18 \end{bmatrix} \quad (27)$$

> *VVV* := array([5, 6, 7])

$$\text{VVV} := [5 \ 6 \ 7] \quad (28)$$

> *Prod* := evalm(*VVV* &* *Matriz*)

$$\text{Prod} := [78 \ 36 \ 114] \quad (29)$$

> evalm(*Matriz*)

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & -5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \quad (30)$$

> *ValorCarac* := eigenvalues(*Matriz*) : evalf(%) : evalf(*ValorCarac*[1], 3);
evalf(*ValorCarac*[2], 3); evalf(*ValorCarac*[3], 3)

$$\begin{aligned} &14.1 - 0.01 \text{ I} \\ &-7.94 - 0.0230 \text{ I} \\ &-1.10 + 0.0290 \text{ I} \end{aligned} \quad (31)$$

> with(DEtools)

[*AreSimilar, Closure, DENormal, DEplot, DEplot3d, DEplot_polygon, DFactor, DFactorLCLM, DFactorsols, Dchangevar, Desingularize, FindODE, 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, hypergeometricsols, 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*]

> *with(plots)*

[*animate, animate3d, animatecurve, arrow, changecoords, complexplot, complexplot3d, conformal, conformal3d, contourplot, contourplot3d, coordplot, coordplot3d, densityplot, display, dualaxisplot, fieldplot, fieldplot3d, gradplot, gradplot3d, implicitplot, implicitplot3d, inequal, interactive, interactiveparams, intersectplot, listcontplot, listcontplot3d, listdensityplot, listplot, listplot3d, loglogplot, logplot, matrixplot, multiple, odeplot, pareto, plotcompare, pointplot, pointplot3d, polarplot, polygonplot, polygonplot3d, polyhedra_supported, polyhedraplot, rootlocus, semilogplot, setcolors, setoptions, setoptions3d, shadebetween, spacecurve, sparsematrixplot, surfdata, textplot, textplot3d, tubeplot*]

> *with(PDEtools)*

[*CanonicalCoordinates, ChangeSymmetry, CharacteristicQ, CharacteristicQInvariants, ConservedCurrentTest, ConservedCurrents, ConsistencyTest, D_Dx, DeterminingPDE, Eta_k, Euler, FirstIntegralSolver, FromJet, FunctionFieldSolutions, InfinitesimalGenerator, Infinitesimals, IntegratingFactorTest, IntegratingFactors, InvariantEquation, InvariantSolutions, InvariantTransformation, Invariants, Laplace, Library, PDEplot, PolynomialSolutions, ReducedForm, SimilaritySolutions, SimilarityTransformation, Solve, SymmetryCommutator, SymmetryGauge, SymmetrySolutions, SymmetryTest, SymmetryTransformation, TWSolutions, ToJet, ToMissingDependentVariable, build, casesplit,*

charstrip, dchange, dcoeffs, declare, diff_table, difforder, dpolyform, dsubs, mapde, separability, splitstrip, splitsys, undeclare]

> restart

> Ecuacion := $(x^2 \cdot y^2 - 1) \cdot y' + 2 \cdot x \cdot y^3 = 0$

$$Ecuacion := (x^2 y(x)^2 - 1) \left(\frac{d}{dx} y(x) \right) + 2 x y(x)^3 = 0 \quad (35)$$

> with(DEtools) :

> odeadvisor(Ecuacion)

[[_homogeneous, class G], _rational] (36)

> EcuacionDos := simplify(isolate(eval(subs($y(x) = \frac{1}{z(x)}$), Ecuacion)), diff(z(x), x)))

$$EcuacionDos := \frac{d}{dx} z(x) = -\frac{2 x z(x)}{z(x)^2 - x^2} \quad (37)$$

> odeadvisor(EcuacionDos)

[[_homogeneous, class A], _rational, _dAlembert] (38)

> EcuacionTres := simplify(isolate(eval(subs($z(x) = x \cdot u(x)$), EcuacionDos)), diff(u(x), x)))

$$EcuacionTres := \frac{d}{dx} u(x) = \frac{u(x) \left(-1 - \frac{2}{-1 + u(x)^2} \right)}{x} \quad (39)$$

> odeadvisor(EcuacionTres)

[_separable] (40)

> M := $- \left(u \cdot \left(-1 - \frac{2}{-1 + u^2} \right) \right)$

$$M := -u \left(-1 - \frac{2}{u^2 - 1} \right) \quad (41)$$

> N := x

$$N := x \quad (42)$$

> P := -1; Q := $u \cdot \left(-1 - \frac{2}{-1 + u^2} \right)$; R := x; S := 1

$$P := -1$$

$$Q := u \left(-1 - \frac{2}{u^2 - 1} \right)$$

$$R := x$$

$$S := 1$$

(43)

> SolGral := $\int \left(\frac{P}{R}, x \right) + \int \left(\frac{S}{Q}, u \right) = _C1$

$$SolGral := -\ln(x) - \ln(u^2 + 1) + \ln(u) = _C1 \quad (44)$$

> SolGralDos := simplify(exp(lhs(SolGral))) = _C1

(45)

$$SolGralDos := \frac{u}{x(u^2 + 1)} = _C1 \quad (45)$$

$$> SolGralTres := simplify\left(subs\left(u = \frac{z(x)}{x}, SolGralDos\right)\right)$$

$$SolGralTres := \frac{z(x)}{z(x)^2 + x^2} = _C1 \quad (46)$$

$$> SolGralCuatro := simplify\left(subs\left(z(x) = \frac{1}{y(x)}, SolGralTres\right)\right)$$

$$SolGralCuatro := \frac{y(x)}{x^2 y(x)^2 + 1} = _C1 \quad (47)$$

> Ecuacion

$$(x^2 y(x)^2 - 1) \left(\frac{d}{dx} y(x) \right) + 2 x y(x)^3 = 0 \quad (48)$$

$$> DerSolGral := isolate(diff(SolGralCuatro, x), diff(y(x), x))$$

$$DerSolGral := \frac{d}{dx} y(x) = -\frac{2 x y(x)^3}{x^2 y(x)^2 - 1} \quad (49)$$

$$> DerEcuacion := isolate(Ecuacion, diff(y(x), x))$$

$$DerEcuacion := \frac{d}{dx} y(x) = -\frac{2 x y(x)^3}{x^2 y(x)^2 - 1} \quad (50)$$

$$> Comprobar := simplify(rhs(DerEcuacion) - rhs(DerSolGral)) = 0$$

$$Comprobar := 0 = 0 \quad (51)$$

$$> Solucion := dsolve(Ecuacion)$$

$$Solucion := y(x) = \frac{c_1 - \sqrt{c_1^2 - 4 x^2}}{2 x^2}, y(x) = \frac{c_1 + \sqrt{c_1^2 - 4 x^2}}{2 x^2} \quad (52)$$

> restart

$$> SolucionGeneral := y(x) = _C1 \cdot \exp(2 x) + _C2 \cdot \exp(3 x)$$

$$SolucionGeneral := y(x) = _C1 e^{2x} + _C2 e^{3x} \quad (53)$$

Obtener su Ecuación Diferencial equivalente

$$> DerEcua := diff(SolucionGeneral, x)$$

$$DerEcua := \frac{d}{dx} y(x) = 2 _C1 e^{2x} + 3 _C2 e^{3x} \quad (54)$$

$$> DerDerEcua := diff(SolucionGeneral, x$2)$$

$$DerDerEcua := \frac{d^2}{dx^2} y(x) = 4 _C1 e^{2x} + 9 _C2 e^{3x} \quad (55)$$

$$> Para := solve(\{DerEcua, DerDerEcua\}, \{_C1, _C2\})$$

$$Para := \left\{ _C1 = \frac{-\frac{d^2}{dx^2} y(x) + 3 \frac{d}{dx} y(x)}{2 e^{2x}}, _C2 = -\frac{-\frac{d^2}{dx^2} y(x) + 2 \frac{d}{dx} y(x)}{3 e^{3x}} \right\} \quad (56)$$

```
> EcuaDif := subs(_C1 = rhs(Para[1]), _C2 = rhs(Para[2]), SolucionGeneral)
```

$$EcuaDif := y(x) = -\frac{\frac{d^2}{dx^2} y(x)}{6} + \frac{5 \frac{d}{dx} y(x)}{6} \quad (57)$$

```
> EcuaDifDos := lhs(EcuaDif)·6 - rhs(EcuaDif)·6 = 0
```

$$EcuaDifDos := 6 y(x) + \frac{d^2}{dx^2} y(x) - 5 \frac{d}{dx} y(x) = 0 \quad (58)$$

```
> SolSol := dsolve(EcuaDifDos)
```

$$SolSol := y(x) = c_1 e^{3x} + c_2 e^{2x} \quad (59)$$

```
> restart
```

```
>
```