```
> restart
> with(linalg)
```

[*BlockDiagonal*, *GramSchmidt*, *JordanBlock*, *LUdecomp*, *QRdecomp*, *Wronskian*, *addcol*, *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*] **(1)**

```
> MatA := array([[1, 2], [-1, 3]])
```

$$MatA := \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix} \quad \textbf{(2)}$$

```
> MatB := array([[6, -4], [3, 7]])
```

$$MatB := \begin{bmatrix} 6 & -4 \\ 3 & 7 \end{bmatrix} \quad \textbf{(3)}$$

```
> SumaAB := evalm(MatA + MatB)
```

$$SumaAB := \begin{bmatrix} 7 & -2 \\ 2 & 10 \end{bmatrix} \quad \textbf{(4)}$$

```
> ProAB := evalm(MatA &* MatB)
```

$$ProAB := \begin{bmatrix} 12 & 10 \\ 3 & 25 \end{bmatrix} \quad \textbf{(5)}$$

```
> ValA := det(MatA)
```

$$ValA := 5 \quad \textbf{(6)}$$

```
> ValB := det(MatB)
```

$$ValB := 54 \quad \textbf{(7)}$$

```
> ValSumaAB := det(SumaAB)
```

$$ValSumaAB := 74 \quad \textbf{(8)}$$

```
> ValAB := det(ProAB)
```

$$ValAB := 270 \quad \textbf{(9)}$$

```
> Carac := eigenvalues(MatA)
```

$$Carac := 2 + I, 2 - I \quad \textbf{(10)}$$

```
> InvMatA := inverse(MatA)
```

(11)

$$InvMatA := \begin{bmatrix} \frac{3}{5} & -\frac{2}{5} \\ \frac{1}{5} & \frac{1}{5} \end{bmatrix} \quad (11)$$

```
> evalm(MatA)
```

$$\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix} \quad (12)$$

```
> Ident := evalm(MatA &* InvMatA)
```

$$Ident := \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad (13)$$

```
> restart
```

CAMBIO DE PAQUETE

```
> 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*] (14)

```
> 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*, *spacecurve*, *sparsematrixplot*, *surfdata*, *textplot*, *textplot3d*, *tubeplot*] (15)

```
> with(inttrans)
```
[addtable, fourier, fouriercos, fouriersin, hankel, hilbert, invfourier, invhilbert, invlaplace, invmellin, laplace, mellin, savetable] (16)

```
> with(PDEtools)
```
[CanonicalCoordinates, ChangeSymmetry, CharacteristicQ, CharacteristicQInvariants, ConservedCurrentTest, ConservedCurrents, ConsistencyTest, D_Dx, DeterminingPDE, Eta_k, Euler, 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, build, casesplit, charstrip, dchange, dcoeffs, declare, diff_table, difforder, dpolyform, dsubs, mapde, separability, splitstrip, splitsys, undeclare] (17)

```
> restart
> Ecua := (5·x··3·y(x)··2 + 24·x·y(x)··3 − 12·y(x)) + (2·x··4·y(x) + 24·x··2·y(x)··2 − 6·x)·diff(y(x), x) = 0
```
$$Ecua := 5x^3 y(x)^2 + 24x\,y(x)^3 - 12\,y(x) + \left(2x^4 y(x) + 24x^2 y(x)^2 - 6x\right)\left(\frac{d}{dx}\,y(x)\right) = 0 \quad (18)$$

```
> with(DEtools) :
> ComprobacionUno := odeadvisor(Ecua)
```
ComprobacionUno := [_rational] (19)

```
> FactInt := intfactor(Ecua)
```
FactInt := x (20)

```
> EcuaExacta := (FactInt·Ecua)
```
$$EcuaExacta := x\left(5x^3 y(x)^2 + 24x\,y(x)^3 - 12\,y(x) + \left(2x^4 y(x) + 24x^2 y(x)^2 - 6x\right)\left(\frac{d}{dx}\,y(x)\right)\right) = 0 \quad (21)$$

```
> ComprobacionDos := odeadvisor(EcuaExacta)
```
ComprobacionDos := [_exact, _rational] (22)

```
> SolGral := exactsol(EcuaExacta) :
> MM := x·(5 x^3 y^2 + 24 x y^3 − 12 y)
```
MM := x (5 x^3 y^2 + 24 x y^3 − 12 y) (23)

```
> NN := x·(2 x^4 y + 24 x^2 y^2 − 6 x)
```
NN := x (2 x^4 y + 24 x^2 y^2 − 6 x) (24)

```
> ComprobacionTres := simplify(diff(MM, y) − diff(NN, x)) = 0
```
ComprobacionTres := 0 = 0 (25)

```
> IntMMx := int(MM, x)
```
IntMMx := x^5 y^2 + 8 x^3 y^3 − 6 x^2 y (26)

```
> SolGral := expand(IntMMx + int((NN − diff(IntMMx, y)), y)) = C
```
SolGral := x^5 y^2 + 8 x^3 y^3 − 6 x^2 y = C (27)

```
> restart
> Ecua := (2·x·y(x)··2 − 3·y(x)··3) + (7 − 3·x·y(x)··2)·diff(y(x), x) = 0
```

$$Ecua := 2\,x\,y(x)^2 - 3\,y(x)^3 + \left(7 - 3\,x\,y(x)^2\right)\left(\frac{d}{dx}\,y(x)\right) = 0 \quad (28)$$

```
> with(DEtools) :
> CompUno := odeadvisor(Ecua)
```

$$CompUno := [\_rational] \quad (29)$$

```
> FactInt := intfactor(Ecua)
```

$$FactInt := \frac{1}{y(x)^2} \quad (30)$$

```
> FactIntUno := 1/y^2
```

$$FactIntUno := \frac{1}{y^2} \quad (31)$$

```
> M := 2·x·y··2 - 3·y··3
```

$$M := 2\,x\,y^2 - 3\,y^3 \quad (32)$$

```
> N := 7 - 3 x y^2
```

$$N := -3\,x\,y^2 + 7 \quad (33)$$

```
> MM := simplify(FactIntUno·M)
```

$$MM := 2\,x - 3\,y \quad (34)$$

```
> NN := expand(FactIntUno·N)
```

$$NN := -3\,x + \frac{7}{y^2} \quad (35)$$

```
> CompDos := diff(MM, y) = diff(NN, x)
```

$$CompDos := -3 = -3 \quad (36)$$

```
> IntNNy := int(NN, y)
```

$$IntNNy := -3\,x\,y - \frac{7}{y} \quad (37)$$

```
> SolGral := IntNNy + int((MM - diff(IntNNy, x)), x) = C
```

$$SolGral := -3\,x\,y - \frac{7}{y} + x^2 = C \quad (38)$$

```
>
```