```
> restart
> Ecuacion := x··2 + 5 ·x + 6 = 0 :
> Ecuacion;
```
$$x^2 + 5x + 6 = 0 \tag{1}$$

```
> Ecuacion
```
$$x^2 + 5x + 6 = 0 \tag{2}$$

```
> Raiz := solve(Ecuacion)
```
$$Raiz := -2, -3 \tag{3}$$

```
> Raiz[1]
```
$$-2 \tag{4}$$

```
> Raiz[2]
```
$$-3 \tag{5}$$

```
> EcuacionOriginal := expand((x − Raiz[1])·(x − Raiz[2])) = 0
```
$$EcuacionOriginal := x^2 + 5x + 6 = 0 \tag{6}$$

```
> EcuacionDos := x··2 + x + 1 = 0
```
$$EcuacionDos := x^2 + x + 1 = 0 \tag{7}$$

```
> RaizDos := solve(EcuacionDos)
```
$$RaizDos := -\frac{1}{2} + \frac{1}{2} I\sqrt{3}, -\frac{1}{2} - \frac{1}{2} I\sqrt{3} \tag{8}$$

```
> RaizDos[1]; RaizDos[2]
```
$$-\frac{1}{2} + \frac{1}{2} I\sqrt{3}$$
$$-\frac{1}{2} - \frac{1}{2} I\sqrt{3} \tag{9}$$

```
> DameReal := Re(RaizDos[1])
```
$$DameReal := -\frac{1}{2} \tag{10}$$

```
> DameImaginaria := Im(RaizDos[1])
```
$$DameImaginaria := \frac{1}{2}\sqrt{3} \tag{11}$$

```
> DameImaginariaDos := Im(RaizDos[2])
```
$$DameImaginariaDos := -\frac{1}{2}\sqrt{3} \tag{12}$$

```
> evalf(DameReal)
```
$$-0.5000000000 \tag{13}$$

```
> evalf(DameImaginaria)
```
$$0.8660254040 \tag{14}$$

```
> evalf(DameReal, 2)
```
$$-0.50 \tag{15}$$

```
> evalf(DameImaginariaDos, 4)
```
$$-0.8660 \tag{16}$$

```
> Digits := 20
```
$$Digits := 20 \tag{17}$$

> $evalf(DameImaginaria)$
$$0.8660254037844386467\overline{5} \tag{18}$$

> $evalf(lambda)$
$$\lambda \tag{19}$$

> $evalf(alpha)$
$$\alpha \tag{20}$$

> $evalf(beta)$
$$\beta \tag{21}$$

> $evalf(pi);$
$$\pi \tag{22}$$

> $evalf(PI)$
$$\Pi \tag{23}$$

> $evalf(Pi)$
$$3.1415926535897932385 \tag{24}$$

> $evalf(Pi, 100)$
$$3.141592653589793238462643383279502884197169399375105820974944592307816406286\backslash \\ 208998628034825342117068 \tag{25}$$

> $evalf(Pi, 1000):$
> $evalf(Pi, 10000):$
> $evalf(exp(1))$
$$2.718281828459045235\overline{4} \tag{26}$$

>

> $Euler := exp(Pi \cdot I)$
$$Euler := -1 \tag{27}$$

> $restart$
> $evalf(exp(1))$
$$2.718281828 \tag{28}$$

> $restart$
> $gravedad := \dfrac{981}{100}$
$$gravedad := \frac{981}{100} \tag{29}$$

>

> $evalf(gravedad)$
$$9.810000000 \tag{30}$$

> $with(DEtools)$
$[AreSimilar, Closure, DEnormal, DEplot, DEplot3d, DEplot\_polygon, DFactor,$ (31)
    $DFactorLCLM, DFactorsols, Dchangevar, Desingularize, FunctionDecomposition, GCRD,$
    $Gosper, Heunsols, Homomorphisms, IVPsol, IsHyperexponential, LCLM, MeijerGsols,$
    $MultiplicativeDecomposition, ODEInvariants, PDEchangecoords, PolynomialNormalForm,$
    $RationalCanonicalForm, ReduceHyperexp, RiemannPsols, Xchange, Xcommutator, Xgauge,$
    $Zeilberger, abelsol, adjoint, autonomous, bernoullisol, buildsol, buildsym, canoni, caseplot,$
    $casesplit, checkrank, chinisol, clairautsol, constcoeffsols, convertAlg, convertsys,$

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]

> *with(linalg)*

$[BlockDiagonal, GramSchmidt, JordanBlock, LUdecomp, QRdecomp, Wronskian, addcol,$ **(32)**
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]

> $VectorSimple := [2, 3, 4, 5]$

$$VectorSimple := [2, 3, 4, 5]$$ **(33)**

> $MatrizUno := matrix([[2, 3, 4, 5], [6, 7, 8, 9], [-1, -2, 5, 4], [3, 6, -8, -9]])$

$$MatrizUno := \begin{bmatrix} 2 & 3 & 4 & 5 \\ 6 & 7 & 8 & 9 \\ -1 & -2 & 5 & 4 \\ 3 & 6 & -8 & -9 \end{bmatrix}$$ **(34)**

> $det(MatrizUno)$

$$128$$ **(35)**

> $Inversa := inverse(MatrizUno)$

(36)

$$Inversa := \begin{bmatrix} -\dfrac{169}{128} & \dfrac{85}{128} & -\dfrac{13}{32} & -\dfrac{1}{4} \\[2mm] \dfrac{117}{128} & -\dfrac{49}{128} & \dfrac{9}{32} & \dfrac{1}{4} \\[2mm] -\dfrac{15}{128} & \dfrac{3}{128} & \dfrac{21}{32} & \dfrac{1}{4} \\[2mm] \dfrac{35}{128} & -\dfrac{7}{128} & -\dfrac{17}{32} & -\dfrac{1}{4} \end{bmatrix}$$

(36)

> $Identidad := evalm(MatrizUno \,\&* Inversa)$

$$Identidad := \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

(37)

> $restart$

> $semana := [\,lunes, martes, miércoles, jueves, viernes, sábado, domingo\,]$

$$semana := [\,lunes, martes, miércoles, jueves, viernes, sábado, domingo\,]$$ (38)

> $DiaHabil := semana[\,1..5\,]$

$$DiaHabil := [\,lunes, martes, miércoles, jueves, viernes\,]$$ (39)

> $DiaFestivo := semana[\,6..7\,]$

$$DiaFestivo := [\,sábado, domingo\,]$$ (40)

> $semana[\,2\,]$

$$martes$$ (41)

> $OrdenAlfabetico := sort(semana)$

$$OrdenAlfabetico := [\,domingo, jueves, lunes, martes, miércoles, sábado, viernes\,]$$ (42)

> $restart$

> $FuncionUno := y(x) = x\cdot\cdot 2 \cdot \exp(5\cdot x) \cdot \cos(3\cdot x)$

$$FuncionUno := y(x) = x^2\, e^{5x} \cos(3\,x)$$ (43)

> $DerFuncion := diff(FuncionUno, x)$

$$DerFuncion := \frac{d}{dx}\, y(x) = 2\, x\, e^{5x} \cos(3\,x) + 5\, x^2\, e^{5x} \cos(3\,x) - 3\, x^2\, e^{5x} \sin(3\,x)$$ (44)

> $AntiDerivada := simplify(int(rhs(DerFuncion), x))$

$$AntiDerivada := x^2\, e^{5x} \cos(3\,x)$$ (45)

> $IntDefinida := int(rhs(FuncionUno), x = 0..1)$

$$IntDefinida := \frac{5}{9826} + \frac{584}{4913}\, e^5 \cos(3) + \frac{228}{4913}\, e^5 \sin(3)$$ (46)
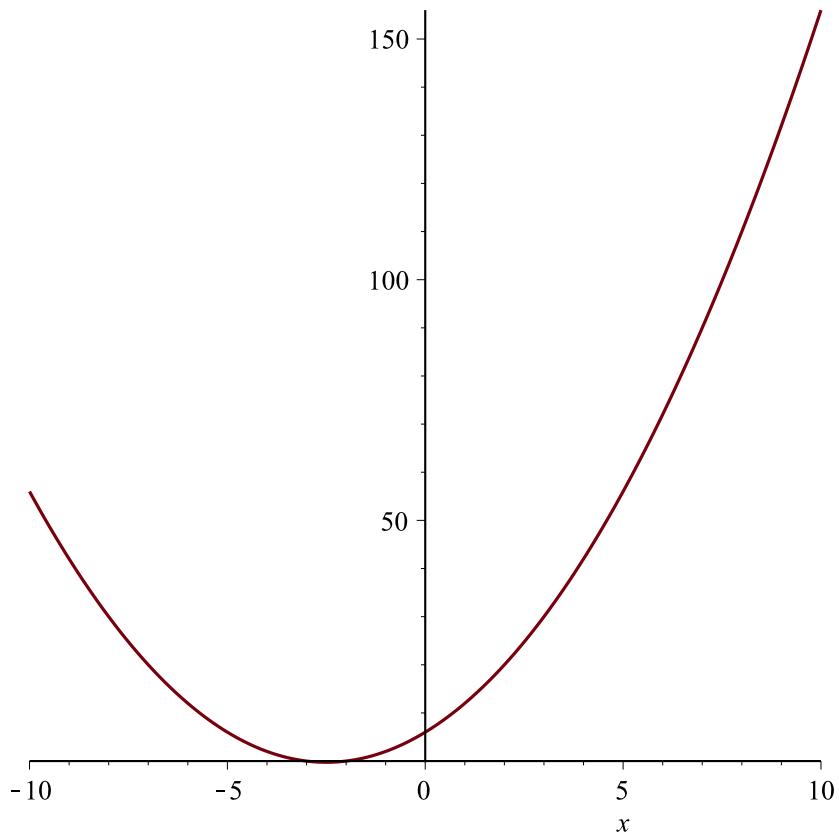
> $evalf(\%, 20)$

$$-16.492602203717520839$$ (47)

> $evalf(\%\%\%)$

$$-16.49260221$$ (48)

> $restart$

> $Ecuacion := x\cdot\cdot 2 + 5\cdot x + 6 = 0$

$$Ecuacion := x^2 + 5\,x + 6 = 0 \qquad\qquad \textbf{(49)}$$

> $plot(\,lhs(\,Ecuacion\,)\,)$

> $plot(\,lhs(\,Ecuacion\,),\, x = -4 \,..\, 0\,)$
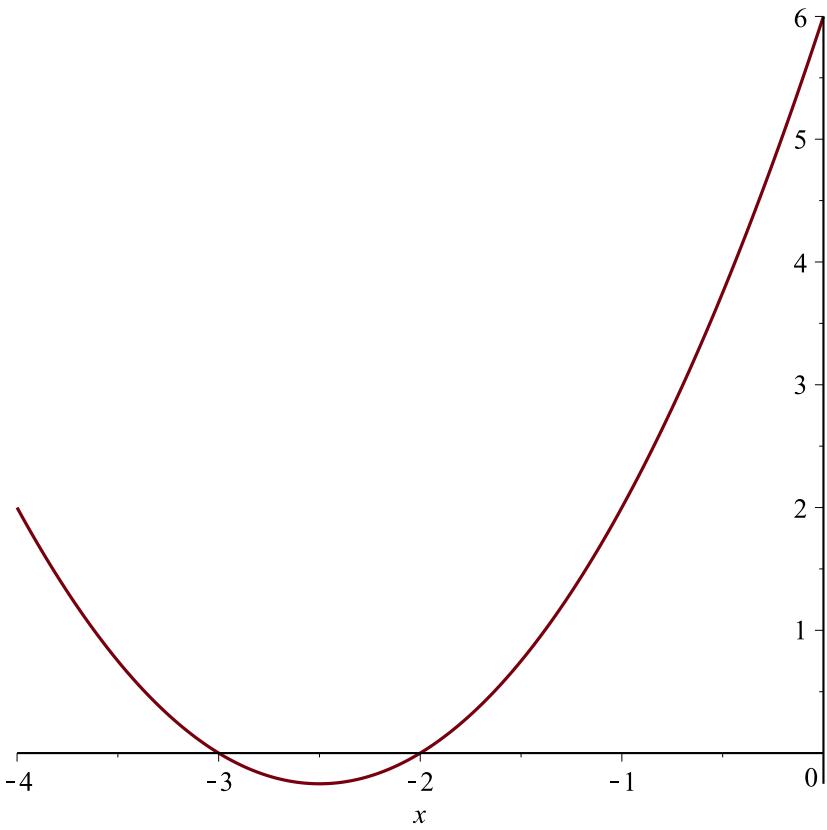
> $Raiz := solve(Ecuacion)$

$$Raiz := -2, -3 \tag{50}$$

> $restart$

>

> $EcuaDif := y'' + 6 \cdot y' + 8 \cdot y = 3 \cdot \exp(4 \cdot x)$

$$EcuaDif := \frac{d^2}{dx^2} y(x) + 6\left(\frac{d}{dx} y(x)\right) + 8\, y(x) = 3\, e^{4x} \tag{51}$$

> $SolucionGeneral := expand(dsolve(EcuaDif))$

$$SolucionGeneral := y(x) = \frac{1}{16}\left(e^x\right)^4 - \frac{1}{2}\,\frac{\_C1}{\left(e^x\right)^4} + \frac{\_C2}{\left(e^x\right)^2} \tag{52}$$

> $CondInic := y(0) = 9, D(y)(0) = -2$

$$CondInic := y(0) = 9, \; D(y)(0) = -2 \tag{53}$$

> $EcuaDifDos := lhs(EcuaDif) - rhs(EcuaDif) = 0$

$$EcuaDifDos := \frac{d^2}{dx^2} y(x) + 6\left(\frac{d}{dx} y(x)\right) + 8\, y(x) - 3\, e^{4x} = 0 \tag{54}$$

> $Comprobar := simplify(eval(subs(y(x) = rhs(SolucionGeneral), EcuaDifDos)))$

$$Comprobar := 0 = 0 \tag{55}$$

>

> $SolucionPart := expand(dsolve(\{EcuaDif, CondInic\}))$

$$SolucionPart := y(x) = \frac{1}{16}\left(e^x\right)^4 - \frac{125}{16\left(e^x\right)^4} + \frac{67}{4\left(e^x\right)^2} \tag{56}$$

> $PrimeraCond := eval(subs(x = 0, SolucionPart))$

$$PrimeraCond := y(0) = 9 \tag{57}$$

> $PrimeraDerivada := diff(SolucionPart, x)$

$$PrimeraDerivada := \frac{d}{dx}\,y(x) = \frac{1}{4}\left(e^x\right)^4 + \frac{125}{4\left(e^x\right)^4} - \frac{67}{2\left(e^x\right)^2} \tag{58}$$

> $SegundaCond := eval(subs(x = 0, diff(rhs(SolucionPart), x)))$

$$SegundaCond := -2 \tag{59}$$

> $plot(rhs(SolucionPart), x = -0.5 .. 0.5)$
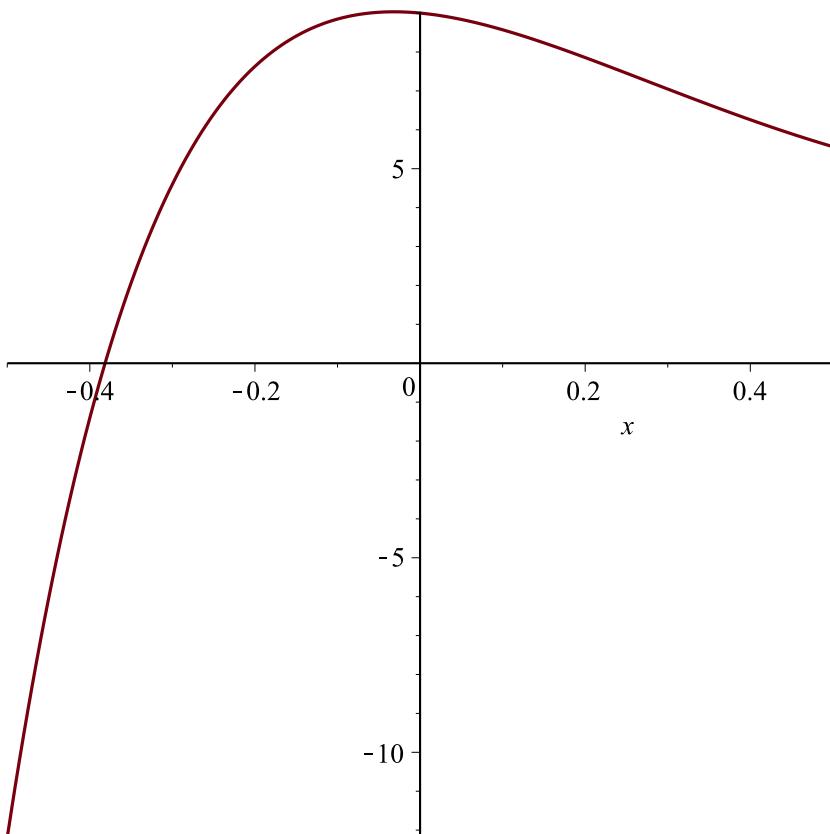
> $with(plots)$

$[animate, animate3d, animatecurve, arrow, changecoords, complexplot, complexplot3d,$ \tag{60}
$\quad conformal, conformal3d, contourplot, contourplot3d, coordplot, coordplot3d, densityplot,$
$\quad display, dualaxisplot, fieldplot, fieldplot3d, gradplot, gradplot3d, implicitplot,$
$\quad implicitplot3d, inequal, interactive, interactiveparams, intersectplot, listcontplot,$

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]

> *with(PDEtools)*

[*CanonicalCoordinates, ChangeSymmetry, CharacteristicQ, CharacteristicQInvariants,* **(61)**
   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]

>