```
> restart
> Ecua := y''-5·y'+6·y=3·exp(-5 x)+4·cos(2·x)
```

$$Ecua := \frac{d^2}{dx^2} y(x) - 5 \frac{d}{dx} y(x) + 6\, y(x) = 3\, e^{-5\,x} + 4 \cos(2\,x) \tag{1}$$

```
> CondIni := y(0)=8, D(y)(0)=-4
```

$$CondIni := y(0) = 8,\ D(y)(0) = -4 \tag{2}$$

```
> SolGral := dsolve(Ecua)
```

$$SolGral := y(x) = e^{2\,x} c_2 + e^{3\,x} c_1 - \frac{10 \cos(x) \sin(x)}{13} + \frac{2 \cos(x)^2}{13} - \frac{1}{13} + \frac{3\, e^{-5\,x}}{56} \tag{3}$$

```
> SolGralHom := y(x) = e^(2 x) c[2] + e^(3 x) c[1]
```

$$SolGralHom := y(x) = e^{2\,x} c_2 + e^{3\,x} c_1 \tag{4}$$

```
> SolPartQ := y(x) = -(10 cos(x) sin(x))/13 + (2 cos(x)^2)/13 - 1/13 + (3 e^(-5 x))/56
```

$$SolPartQ := y(x) = -\frac{10 \cos(x) \sin(x)}{13} + \frac{2 \cos(x)^2}{13} - \frac{1}{13} + \frac{3\, e^{-5\,x}}{56} \tag{5}$$

```
> evalf(%, 3)
```

$$y(x) = -0.769 \cos(x) \sin(x) + 0.154 \cos(x)^2 - 0.0769 + 0.0536\, e^{-5.\,x} \tag{6}$$

```
> SolPartFinal := dsolve({CondIni, Ecua})
```

$$SolPartFinal := y(x) = \frac{186\, e^{2\,x}}{7} - \frac{1945\, e^{3\,x}}{104} - \frac{10 \cos(x) \sin(x)}{13} + \frac{2 \cos(x)^2}{13} - \frac{1}{13} + \frac{3\, e^{-5\,x}}{56} \tag{7}$$

```
> evalf(%, 3)
```

$$y(x) = 26.6\, e^{2.\,x} - 18.7\, e^{3.\,x} - 0.769 \cos(x) \sin(x) + 0.154 \cos(x)^2 - 0.0769 + 0.0536\, e^{-5.\,x} \tag{8}$$

```
> CondIniUno := simplify(subs(x=0, SolPartFinal))
```

$$CondIniUno := y(0) = 8 \tag{9}$$

```
> CondIniDos := D(y)(0) = simplify(subs(x=0, rhs(diff(SolPartFinal, x))))
```

$$CondIniDos := D(y)(0) = -4 \tag{10}$$

```
> CondIni
```

$$y(0) = 8,\ D(y)(0) = -4 \tag{11}$$

```
> SolGral
```

$$y(x) = e^{2\,x} c_2 + e^{3\,x} c_1 - \frac{10 \cos(x) \sin(x)}{13} + \frac{2 \cos(x)^2}{13} - \frac{1}{13} + \frac{3\, e^{-5\,x}}{56} \tag{12}$$

```
> EcuaUno := simplify(subs(x=0, SolGral))
```

$$EcuaUno := y(0) = c_2 + c_1 + \frac{95}{728} \tag{13}$$

```
> EcuaDos := D(y)(0) = simplify(subs(x=0, rhs(diff(SolGral, x))))
```

$$EcuaDos := D(y)(0) = 2\, c_2 + 3\, c_1 - \frac{755}{728} \tag{14}$$

> $Para := solve([rhs(EcuaUno) = 8, rhs(EcuaDos) = -4])$

$$Para := \left\{c_1 = -\frac{1945}{104}, c_2 = \frac{186}{7}\right\} \tag{15}$$

> $SolPartFinalDos := subs(Para, SolGral)$

$$SolPartFinalDos := y(x) = \frac{186\,e^{2x}}{7} - \frac{1945\,e^{3x}}{104} - \frac{10\cos(x)\sin(x)}{13} + \frac{2\cos(x)^2}{13} - \frac{1}{13} + \frac{3\,e^{-5x}}{56} \tag{16}$$

> $SolPartFinal$

$$y(x) = \frac{186\,e^{2x}}{7} - \frac{1945\,e^{3x}}{104} - \frac{10\cos(x)\sin(x)}{13} + \frac{2\cos(x)^2}{13} - \frac{1}{13} + \frac{3\,e^{-5x}}{56} \tag{17}$$

> $SolGralHom := y(x) = \frac{186\,e^{2x}}{7} - \frac{1945\,e^{3x}}{104}$

$$SolGralHom := y(x) = \frac{186\,e^{2x}}{7} - \frac{1945\,e^{3x}}{104} \tag{18}$$

> $SolPartHomAsociada := simplify(subs(x = 0, SolGralHom))$

$$SolPartHomAsociada := y(0) = \frac{5729}{728} \tag{19}$$

> $yy[1] := \exp(2x); yy[2] := \exp(3x); yy[3] := \cos(x)\cdot\sin(x); yy[4] := \cos(x)^2; yy[5] := 1;$
$yy[6] := \exp(-5x)$

$$yy_1 := e^{2x}$$
$$yy_2 := e^{3x}$$
$$yy_3 := \cos(x)\sin(x)$$
$$yy_4 := \cos(x)^2$$
$$yy_5 := 1$$
$$yy_6 := e^{-5x} \tag{20}$$

> $with(linalg):$

> $WW := wronskian([yy[1], yy[2], yy[3], yy[4], yy[5], yy[6]], x)$

$$WW := \tag{21}$$

$$\begin{bmatrix} e^{2x} & e^{3x} & \cos(x)\sin(x) & \cos(x)^2 & 1 & e^{-5x} \\ 2e^{2x} & 3e^{3x} & -\sin(x)^2 + \cos(x)^2 & -2\cos(x)\sin(x) & 0 & -5e^{-5x} \\ 4e^{2x} & 9e^{3x} & -4\cos(x)\sin(x) & 2\sin(x)^2 - 2\cos(x)^2 & 0 & 25e^{-5x} \\ 8e^{2x} & 27e^{3x} & 4\sin(x)^2 - 4\cos(x)^2 & 8\cos(x)\sin(x) & 0 & -125e^{-5x} \\ 16e^{2x} & 81e^{3x} & 16\cos(x)\sin(x) & -8\sin(x)^2 + 8\cos(x)^2 & 0 & 625e^{-5x} \\ 32e^{2x} & 243e^{3x} & -16\sin(x)^2 + 16\cos(x)^2 & -32\cos(x)\sin(x) & 0 & -3125e^{-5x} \end{bmatrix}$$

> $comprobarCinco := simplify(det(WW)) \neq 0$

(22)

$$comprobarCinco := 10133760 \neq 0 \quad (22)$$

>

> *SolPartQ*

$$y(x) = -\frac{10\cos(x)\sin(x)}{13} + \frac{2\cos(x)^2}{13} - \frac{1}{13} + \frac{3\,e^{-5x}}{56} \quad (23)$$

> $CondIniPartQ := simplify(subs(x=0, rhs(SolPartQ)))$

$$CondIniPartQ := \frac{95}{728} \quad (24)$$

> $CondIniAmbas := y(0) = rhs(SolPartHomAsociada) + CondIniPartQ$

$$CondIniAmbas := y(0) = 8 \quad (25)$$

> *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*] (26)

> *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*, (27)

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

```
> with(inttrans)
```

[*addtable*, *fourier*, *fouriercos*, *fouriersin*, *hankel*, *hilbert*, *invfourier*, *invhilbert*, *invlaplace*, *invmellin*, *laplace*, *mellin*, *savetable*, *setup*] **(28)**

```
> 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*] **(29)**

```
> +
```

Error, unable to parse

```
>
```