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> restart
> Ecua := diff(y(x), x$2) + 3·diff(y(x), x) = exp(x)
      Ecua :=  $\frac{d^2}{dx^2} y(x) + 3 \left( \frac{d}{dx} y(x) \right) = e^x$  (1)
> SolGral := dsolve(Ecua)
      SolGral :=  $y(x) = \frac{1}{4} e^x - \frac{1}{3} e^{-3x} \_C1 + \_C2$  (2)
> EcuaHom := lhs(Ecua) = 0
      EcuaHom :=  $\frac{d^2}{dx^2} y(x) + 3 \left( \frac{d}{dx} y(x) \right) = 0$  (3)
> SolGralHom := dsolve(EcuaHom)
      SolGralHom :=  $y(x) = \_C1 + \_C2 e^{-3x}$  (4)
> SolGralNoHom := y(x) = A(x) + B(x)·exp(-3·x)
      SolGralNoHom :=  $y(x) = A(x) + B(x) e^{-3x}$  (5)
> yy[1] := 1; yy[2] := exp(-3·x)
      yy1 := 1
      yy2 :=  $e^{-3x}$  (6)
> 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, sylveste, toeplitz, trace, transpose, vandermonde, vecpotent,
 vectdim, vector, wronskian]
> WW := wronskian([yy[1], yy[2]], x)
      WW :=  $\begin{bmatrix} 1 & e^{-3x} \\ 0 & -3 e^{-3x} \end{bmatrix}$  (8)
> BB := array([0, rhs(Ecua)])
      BB :=  $\begin{bmatrix} 0 & e^x \end{bmatrix}$  (9)
> DerParVar := linsolve(WW, BB)
      DerParVar :=  $\begin{bmatrix} \frac{1}{3} e^x & -\frac{1}{3} \frac{e^x}{e^{-3x}} \end{bmatrix}$  (10)

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$$\begin{aligned} &> A(x) := \text{int}(\text{DerParVar}[1], x) + C[1] \\ &\quad A(x) := \frac{1}{3} e^x + C_1 \end{aligned} \quad (11)$$

$$\begin{aligned} &> B(x) := \text{int}(\text{DerParVar}[2], x) + C[2] \\ &\quad B(x) := -\frac{1}{12} \frac{e^x}{e^{-3x}} + C_2 \end{aligned} \quad (12)$$

$$\begin{aligned} &> \text{expand}(\text{SolGralNoHom}) \\ &\quad y(x) = \frac{1}{4} e^x + C_1 + \frac{C_2}{(e^x)^3} \end{aligned} \quad (13)$$

$$\begin{aligned} &> \text{SolGral} \\ &\quad y(x) = \frac{1}{4} e^x - \frac{1}{3} e^{-3x} _C1 + _C2 \end{aligned} \quad (14)$$

$$\begin{aligned} &> \text{restart} \\ &> \text{Ecua} := \text{diff}(y(x), x\$2) + 4 \cdot y(x) = \sin(2 \cdot x) \\ &\quad \text{Ecua} := \frac{d^2}{dx^2} y(x) + 4 y(x) = \sin(2 x) \end{aligned} \quad (15)$$

$$\begin{aligned} &> \text{EcuaHom} := \text{lhs}(\text{Ecua}) = 0 \\ &\quad \text{EcuaHom} := \frac{d^2}{dx^2} y(x) + 4 y(x) = 0 \end{aligned} \quad (16)$$

$$\begin{aligned} &> \text{SolHom} := \text{dsolve}(\text{EcuaHom}) \\ &\quad \text{SolHom} := y(x) = _C1 \sin(2 x) + _C2 \cos(2 x) \end{aligned} \quad (17)$$

$$\begin{aligned} &> yy[1] := \sin(2 \cdot x); yy[2] := \cos(2 \cdot x) \\ &\quad yy_1 := \sin(2 x) \\ &\quad yy_2 := \cos(2 x) \end{aligned} \quad (18)$$

$$\begin{aligned} &> \text{SolGral} := y(x) = A \cdot yy[1] + B \cdot yy[2] \\ &\quad \text{SolGral} := y(x) = A \sin(2 x) + B \cos(2 x) \end{aligned} \quad (19)$$

$$\begin{aligned} &> \text{with}(\text{linalg}) : \\ &> WW := \text{wronskian}([yy[1], yy[2]], x) \\ &\quad WW := \begin{bmatrix} \sin(2 x) & \cos(2 x) \\ 2 \cos(2 x) & -2 \sin(2 x) \end{bmatrix} \end{aligned} \quad (20)$$

$$\begin{aligned} &> BB := \text{array}([0, \text{rhs}(\text{Ecua})]) \\ &\quad BB := \begin{bmatrix} 0 & \sin(2 x) \end{bmatrix} \end{aligned} \quad (21)$$

$$\begin{aligned} &> \text{DerPar} := \text{simplify}(\text{linsolve}(WW, BB)) \\ &\quad \text{DerPar} := \begin{bmatrix} \frac{1}{2} \sin(2 x) \cos(2 x) & -\frac{1}{2} \sin(2 x)^2 \end{bmatrix} \end{aligned} \quad (22)$$

$$\begin{aligned} &> A := \text{int}(\text{DerPar}[1], x) + C[1] \\ &\quad A := -\frac{1}{8} \cos(2 x)^2 + C_1 \end{aligned} \quad (23)$$

$$\begin{aligned} &> B := \text{int}(\text{DerPar}[2], x) + C[2] \\ &\quad \end{aligned} \quad (24)$$

$$B := \frac{1}{8} \sin(2x) \cos(2x) - \frac{1}{4} x + C_2 \quad (24)$$

> *SolGralNoHom* := simplify(*SolGral*)

$$\textcolor{blue}{SolGralNoHom} := y(x) = -\frac{1}{4} \cos(2x) x + \cos(2x) C_2 + \sin(2x) C_1 \quad (25)$$

> restart

> *SolGral* := y(x) · 2 · (1 - y(x)) = (x - C[1]) · 2

$$\textcolor{blue}{SolGral} := y(x)^2 (1 - y(x)) = (x - C_1)^2 \quad (26)$$

> *DerSolGral* := diff(*SolGral*, x)

$$\textcolor{blue}{DerSolGral} := 2 y(x) (1 - y(x)) \left(\frac{d}{dx} y(x) \right) - y(x)^2 \left(\frac{d}{dx} y(x) \right) = 2x - 2 C_1 \quad (27)$$

> *Para* := isolate(*DerSolGral*, C[1])

$$\textcolor{blue}{Para} := C_1 = -y(x) (1 - y(x)) \left(\frac{d}{dx} y(x) \right) + \frac{1}{2} y(x)^2 \left(\frac{d}{dx} y(x) \right) + x \quad (28)$$

> *EcuaDif* := subs(C[1] = rhs(*Para*), *SolGral*)

$$\textcolor{blue}{EcuaDif} := y(x)^2 (1 - y(x)) = \left(y(x) (1 - y(x)) \left(\frac{d}{dx} y(x) \right) - \frac{1}{2} y(x)^2 \left(\frac{d}{dx} y(x) \right) \right)^2 \quad (29)$$

> *Comp* := eval(subs(y(x) = 1, *EcuaDif*))

$$\textcolor{blue}{Comp} := 0 = 0 \quad (30)$$

> *SolDos* := y² (1 - y) = (x - C₁)²

$$\textcolor{blue}{SolDos} := y^2 (1 - y) = (x - C_1)^2 \quad (31)$$

> *ParaDos* := isolate(subs(x = 3, y = 12, *SolDos*), C[1]);

$$\textcolor{blue}{ParaDos} := C_1 = -\sqrt{-1584} + 3 \quad (32)$$

> *SolPart* := subs(C[1] = rhs(*ParaDos*), *SolGral*)

$$\textcolor{blue}{SolPart} := y(x)^2 (1 - y(x)) = (x + \sqrt{-1584} - 3)^2 \quad (33)$$

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