```
> restart
> Ecua := y"-7·y'+ 12·y = 5·exp(3·x)
```

$$Ecua := \frac{d^2}{dx^2} y(x) - 7 \left(\frac{d}{dx} y(x) \right) + 12 \, y(x) = 5 \, e^{3\,x} \tag{1}$$

```
> Q := rhs(Ecua)
```

$$Q := 5 \, e^{3\,x} \tag{2}$$

```
> EcuaHom := lhs(Ecua) = 0
```

$$EcuaHom := \frac{d^2}{dx^2} y(x) - 7 \left(\frac{d}{dx} y(x) \right) + 12 \, y(x) = 0 \tag{3}$$

```
> EcuaCarac := m^2 − 7·m + 12 = 0
```

$$EcuaCarac := m^2 - 7 \, m + 12 = 0 \tag{4}$$

```
> Raiz := solve(EcuaCarac)
```

$$Raiz := 4, 3 \tag{5}$$

```
> yy[1] := exp(Raiz[1]·x)
```

$$yy_1 := e^{4\,x} \tag{6}$$

```
> yy[2] := exp(Raiz[2]·x)
```

$$yy_2 := e^{3\,x} \tag{7}$$

```
> SolHom := y(x) = _C1·yy[1] + _C2·yy[2]
```

$$SolHom := y(x) = \_C1 \, e^{4\,x} + \_C2 \, e^{3\,x} \tag{8}$$

```
> SolNoHom := y(x) = A(x)·yy[1] + B(x)·yy[2]
```

$$SolNoHom := y(x) = A(x) \, e^{4\,x} + B(x) \, e^{3\,x} \tag{9}$$

```
> with(linalg) :
> WW := wronskian([yy[1], yy[2]], x)
```

$$WW := \begin{bmatrix} e^{4\,x} & e^{3\,x} \\ 4 \, e^{4\,x} & 3 \, e^{3\,x} \end{bmatrix} \tag{10}$$

```
> Comprobacion := det(WW) ≠ 0
```

$$Comprobacion := - e^{4\,x} e^{3\,x} \neq 0 \tag{11}$$

```
> BB := array([0, Q])
```

$$BB := \begin{bmatrix} 0 & 5 \, e^{3\,x} \end{bmatrix} \tag{12}$$

```
> DerParVar := linsolve(WW, BB) : Aprima := DerParVar[1]; Bprima := DerParVar[2]
```

$$Aprima := \frac{5 \, e^{3\,x}}{e^{4\,x}}$$

$$Bprima := -5 \tag{13}$$

```
> A(x) := int(Aprima, x) + _C1; B(x) := int(Bprima, x) + _C2
```

$$A(x) := - \frac{5 \, e^{3\,x}}{e^{4\,x}} + \_C1$$

$$B(x) := -5 \, x + \_C2 \tag{14}$$

```
> SolFinal := simplify(subs(_C2 = _C10 + 5, _C1 = _C20, simplify(SolNoHom)))
```

$$\tag{15}$$

$$SolFinal := y(x) = \_C20\ e^{4x} + e^{3x}\ \_C10 - 5\ e^{3x}\ x \tag{15}$$

> $SolGralHom := dsolve(EcuaHom)$

$$SolGralHom := y(x) = \_C1\ e^{4x} + \_C2\ e^{3x} \tag{16}$$

> $SolGral := dsolve(Ecua)$

$$SolGral := y(x) = e^{4x}\ \_C2 + e^{3x}\ \_C1 - 5\ e^{3x}\ x \tag{17}$$

> $restart$

> $Ecua := y''' + y'' + y' + y = 5 \cdot \cos(x)$

$$Ecua := \frac{d^3}{dx^3}\ y(x) + \frac{d^2}{dx^2}\ y(x) + \frac{d}{dx}\ y(x) + y(x) = 5\cos(x) \tag{18}$$

> $Q := rhs(Ecua)$

$$Q := 5\cos(x) \tag{19}$$

> $EcuaHom := lhs(Ecua) = 0$

$$EcuaHom := \frac{d^3}{dx^3}\ y(x) + \frac{d^2}{dx^2}\ y(x) + \frac{d}{dx}\ y(x) + y(x) = 0 \tag{20}$$

> $EcuaCarac := m^3 + m^2 + m + 1 = 0$

$$EcuaCarac := m^3 + m^2 + m + 1 = 0 \tag{21}$$

> $Raiz := solve(EcuaCarac) : Raiz[1]; Raiz[2]; Raiz[3]$

$$-1$$
$$I$$
$$-I \tag{22}$$

> $yy[1] := \exp(Raiz[1] \cdot x); yy[2] := \exp(\mathrm{Re}(Raiz[2]) \cdot x) \cdot \cos(\mathrm{Im}(Raiz[2]) \cdot x); yy[3]$
> $\quad := simplify(\exp(\mathrm{Re}(Raiz[2]) \cdot x)) \cdot \sin(\mathrm{Im}(Raiz[2]) \cdot x)$

$$yy_1 := e^{-x}$$

$$yy_2 := \cos(x)$$

$$yy_3 := \sin(x) \tag{23}$$

> $SolHom := y(x) = \_C1 \cdot yy[1] + \_C2 \cdot yy[2] + \_C3 \cdot yy[3]$

$$SolHom := y(x) = \_C1\ e^{-x} + \_C2\cos(x) + \_C3\sin(x) \tag{24}$$

> $SolNoHom := y(x) = A(x) \cdot yy[1] + B(x) \cdot yy[2] + \mathrm{D}(x) \cdot yy[3]$

$$SolNoHom := y(x) = A(x)\ e^{-x} + B(x)\cos(x) + \mathrm{D}(x)\sin(x) \tag{25}$$

> $with(linalg) :$

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

$$WW := \begin{bmatrix} e^{-x} & \cos(x) & \sin(x) \\ -e^{-x} & -\sin(x) & \cos(x) \\ e^{-x} & -\cos(x) & -\sin(x) \end{bmatrix} \tag{26}$$

> $BB := array([0, 0, Q])$

$$BB := \begin{bmatrix} 0 & 0 & 5\cos(x) \end{bmatrix} \tag{27}$$

> $DerParVar := linsolve(WW, BB) : Aprima := simplify(DerParVar[1]); Bprima$
> $\quad := simplify(DerParVar[2]); Dprima := simplify(DerParVar[3])$

$$Aprima := \frac{5}{2} \, e^x \cos(x)$$

$$Bprima := -\frac{5}{2} \, (\cos(x) + \sin(x)) \cos(x)$$

$$Dprima := \frac{5}{2} \, \cos(x) \, (\cos(x) - \sin(x)) \tag{28}$$

> $A(x) := int(Aprima, x) + \_C1;\ B(x) := int(Bprima, x) + \_C2;\ D(x) := int(Dprima, x) + \_C3$

$$A(x) := \frac{5}{4} \, e^x \cos(x) + \frac{5}{4} \, e^x \sin(x) + \_C1$$

$$B(x) := -\frac{5}{4} \, \sin(x) \cos(x) - \frac{5}{4} \, x + \frac{5}{4} \, \cos(x)^2 + \_C2$$

$$D(x) := \frac{5}{4} \, \sin(x) \cos(x) + \frac{5}{4} \, x + \frac{5}{4} \, \cos(x)^2 + \_C3 \tag{29}$$

> $SolFinal := simplify(SolNoHom)$

$$SolFinal := y(x) = \frac{5}{2} \, \cos(x) + \frac{5}{4} \, \sin(x) + \cos(x) \, \_C2 - \frac{5}{4} \, \cos(x) \, x + e^{-x} \, \_C1 + \sin(x) \, \_C3 \tag{30}$$

$$+ \frac{5}{4} \, \sin(x) \, x$$

> $SolUltima := dsolve(Ecua)$

$$SolUltima := y(x) = \left(-\frac{5}{4} \, x + \frac{5}{2} \right) \cos(x) + \left(\frac{5}{4} \, x + \frac{5}{4} \right) \sin(x) + \_C1 \cos(x) + \_C2 \sin(x) \tag{31}$$

$$+ \_C3 \, e^{-x}$$

>
>
>
>