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

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

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

$$EcuaHom := \frac{d^2}{dx^2} y(x) - 5 \left(\frac{d}{dx} y(x) \right) + 6\, y(x) = 0 \tag{2}$$

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

$$Q := 4\, e^{x} \tag{3}$$

```
> EcuaCarac := m^2-5 m+6=0
```

$$EcuaCarac := m^2 - 5\, m + 6 = 0 \tag{4}$$

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

$$Raiz := 3, 2 \tag{5}$$

```
> yy[1] := exp(Raiz[1]·x)
```

$$yy_1 := e^{3x} \tag{6}$$

```
> yy[2] := exp(Raiz[2]·x)
```

$$yy_2 := e^{2x} \tag{7}$$

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

$$SolHomAsoc := y(x) = \_C1\, e^{3x} + \_C2\, e^{2x} \tag{8}$$

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

$$SolNoHom := y(x) = A(x)\, e^{3x} + B(x)\, e^{2x} \tag{9}$$

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

$$WW := \begin{bmatrix} e^{3x} & e^{2x} \\ 3\, e^{3x} & 2\, e^{2x} \end{bmatrix} \tag{10}$$

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

$$BB := \begin{bmatrix} 0 & 4\, e^{x} \end{bmatrix} \tag{11}$$

```
> ParaDer := linsolve(WW, BB)
```

$$ParaDer := \begin{bmatrix} \frac{4\, e^{x}}{e^{3x}} & -\frac{4\, e^{x}}{e^{2x}} \end{bmatrix} \tag{12}$$

```
> Aprima := ParaDer[1]
```

$$Aprima := \frac{4\, e^{x}}{e^{3x}} \tag{13}$$

```
> Bprima := ParaDer[2]
```

$$Bprima := -\frac{4\, e^{x}}{e^{2x}} \tag{14}$$

```
> SolGraLNoHom := y(x)=simplify((int(Aprima, x)+_C1)·yy[1]+(int(Bprima, x)+_C2)
      ·yy[2])
```

$$SolGraLNoHom := y(x) = 2\,e^{x} + \_C2\,e^{2x} + \_C1\,e^{3x} \tag{15}$$

```
> restart
```

```
> Ecua := y'''-y''+y'-y = x^2 + x
```

$$Ecua := \frac{d^3}{dx^3}\,y(x) - \left(\frac{d^2}{dx^2}\,y(x)\right) + \frac{d}{dx}\,y(x) - y(x) = x^2 + x \tag{16}$$

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

$$EcuaHom := \frac{d^3}{dx^3}\,y(x) - \left(\frac{d^2}{dx^2}\,y(x)\right) + \frac{d}{dx}\,y(x) - y(x) = 0 \tag{17}$$

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

$$Q := x^2 + x \tag{18}$$

```
> EcuaCarac := m^3 - m^2 + m - 1 = 0
```

$$EcuaCarac := m^3 - m^2 + m - 1 = 0 \tag{19}$$

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

$$Raiz := 1, I, -I \tag{20}$$

```
> yy[1] := exp(Raiz[1]·x)
```

$$yy_1 := e^{x} \tag{21}$$

```
> yy[2] := exp(Re(Raiz[2])·x)·cos(Im(Raiz[2])·x)
```

$$yy_2 := \cos(x) \tag{22}$$

```
> yy[3] := exp(Re(Raiz[2])·x)·sin(Im(Raiz[2])·x)
```

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

```
> SolGralHomAsocc := y(x) = _C1·yy[1] + _C2·yy[2] + _C3·yy[3]
```

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

```
> SolGralNoHom := y(x) = A(x)·yy[1] + B(x)·yy[2] + D(x)·yy[3]
```

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

```
> 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])
```

$$BB := \begin{bmatrix} 0 & 0 & x^2 + x \end{bmatrix} \tag{27}$$

```
> ParaDer := linsolve(WW, BB)
```

$$ParaDer := \left[\frac{1}{2}\,\frac{x\,(x+1)}{e^{x}},\ -\frac{1}{2}\,\frac{x\,(x+1)\,(\cos(x)-\sin(x))}{\cos(x)^2+\sin(x)^2},\ -\frac{1}{2}\,\frac{(\cos(x)+\sin(x))\,x\,(x+1)}{\cos(x)^2+\sin(x)^2}\right] \tag{28}$$

```
> Aprima := simplify(ParaDer[1])
```

$$Aprima := \frac{1}{2}\, x\,(x+1)\, e^{-x} \tag{29}$$

> $Bprima := simplify(ParaDer[2])$

$$Bprima := -\frac{1}{2}\, x\,(x+1)\,(\cos(x) - \sin(x)) \tag{30}$$

> $Dprima := simplify(ParaDer[3])$

$$Dprima := -\frac{1}{2}\,(\cos(x) + \sin(x))\, x\,(x+1) \tag{31}$$

> $A(x) := int(Aprima, x) + \_C1$

$$A(x) := -\frac{1}{2}\,\left(x^2 + 3\,x + 3\right) e^{-x} + \_C1 \tag{32}$$

> $B(x) := int(Bprima, x) + \_C2$

$$B(x) := -\frac{1}{2}\sin(x)\,x^2 + \frac{3}{2}\sin(x) - \frac{3}{2}\,x\cos(x) - \frac{1}{2}\cos(x)\,x^2 + \frac{1}{2}\cos(x) + \frac{1}{2}\,x\sin(x) + \_C2 \tag{33}$$

> $D(x) := int(Dprima, x) + \_C3$

$$D(x) := -\frac{1}{2}\sin(x)\,x^2 + \frac{1}{2}\sin(x) - \frac{1}{2}\,x\cos(x) - \frac{3}{2}\cos(x) - \frac{3}{2}\,x\sin(x) + \frac{1}{2}\cos(x)\,x^2 + \_C3 \tag{34}$$

> $SolGralFinal := simplify(SolGralNoHom)$

$$SolGralFinal := y(x) = -x^2 - 3\,x - 1 + \_C2\cos(x) + \_C1\, e^{x} + \_C3\sin(x) \tag{35}$$

> $Comprobar := eval(subs(y(x) = rhs(SolGralFinal), lhs(Ecua) - rhs(Ecua) = 0))$

$$Comprobar := 0 = 0 \tag{36}$$

> $restart$

>