```
> restart
> Ecuacion := diff(y(t), t$3) − 3·diff(y(t), t$2) + 4·diff(y(t), t) − 2·y(t) = 4·exp(2·t)
```

$$Ecuacion := \frac{d^3}{dt^3} y(t) - 3\left(\frac{d^2}{dt^2} y(t)\right) + 4\left(\frac{d}{dt} y(t)\right) - 2\,y(t) = 4\,e^{2t} \tag{1}$$

```
> Condiciones := y(0) = 2, D(y)(0) = −3, D(D(y))(0) = 5
```

$$Condiciones := y(0) = 2,\ D(y)(0) = -3,\ D^{(2)}(y)(0) = 5 \tag{2}$$

```
> EcuacionHom := lhs(Ecuacion) = 0
```

$$EcuacionHom := \frac{d^3}{dt^3} y(t) - 3\left(\frac{d^2}{dt^2} y(t)\right) + 4\left(\frac{d}{dt} y(t)\right) - 2\,y(t) = 0 \tag{3}$$

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

$$Q := 4\,e^{2t} \tag{4}$$

```
> EcuacionCarac := m··3 − 3·m··2 + 4·m − 2 = 0
```

$$EcuacionCarac := m^3 - 3\,m^2 + 4\,m - 2 = 0 \tag{5}$$

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

$$Raiz := 1,\ 1 + I,\ 1 - I \tag{6}$$

```
> SolUno := y(t) = exp(Raiz_1·t)
```

$$SolUno := y(t) = e^t \tag{7}$$

```
> SolDos := y(t) = exp(Re(Raiz_2)·t)·cos(Im(Raiz_2)·t)
```

$$SolDos := y(t) = e^t \cos(t) \tag{8}$$

```
> SolTres := y(t) = exp(Re(Raiz_2)·t)·sin(Im(Raiz_2)·t)
```

$$SolTres := y(t) = e^t \sin(t) \tag{9}$$

```
> SolHom := y(t) = C_1·rhs(SolUno) + C_2·rhs(SolDos) + C_3·rhs(SolTres)
```

$$SolHom := y(t) = C_1\,e^t + C_2\,e^t \cos(t) + C_3\,e^t \sin(t) \tag{10}$$

```
> SolNoHom := y(t) = A·rhs(SolUno) + B·rhs(SolDos) + E·rhs(SolTres)
```

$$SolNoHom := y(t) = A\,e^t + B\,e^t \cos(t) + E\,e^t \sin(t) \tag{11}$$

```
> with(linalg) :
> WW := wronskian([rhs(SolUno), rhs(SolDos), rhs(SolTres)], t)
```

$$WW := \begin{bmatrix} e^t & e^t \cos(t) & e^t \sin(t) \\ e^t & e^t \cos(t) - e^t \sin(t) & e^t \sin(t) + e^t \cos(t) \\ e^t & -2\,e^t \sin(t) & 2\,e^t \cos(t) \end{bmatrix} \tag{12}$$

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

$$AA := \begin{bmatrix} 0 & 0 & 4\,e^{2t} \end{bmatrix} \tag{13}$$

```
> SOL := simplify(linsolve(WW, AA))
```

$$SOL := \begin{bmatrix} 4\,e^t & -4\,e^t \cos(t) & -4\,e^t \sin(t) \end{bmatrix} \tag{14}$$

```
> Aprima := SOL_1; Bprima := SOL_2; Eprima := SOL_3;
```

$$Aprima := 4\,e^t$$

$$Bprima := -4\,e^t \cos(t)$$

$$Eprima := -4\,e^t \sin(t) \tag{15}$$

> $A := int(Aprima, t) + C_1; B := int(Bprima, t) + C_2; E := int(Eprima, t) + C_3$

$$A := 4\,e^t + C_1$$

$$B := -2\,e^t \cos(t) - 2\,e^t \sin(t) + C_2$$

$$E := 2\,e^t \cos(t) - 2\,e^t \sin(t) + C_3 \tag{16}$$

> $SolucionGeneral := expand(simplify(SolNoHom))$

$$SolucionGeneral := y(t) = 2\left(e^t\right)^2 + C_1\,e^t + C_2\,e^t \cos(t) + C_3\,e^t \sin(t) \tag{17}$$

> $Condiciones;$

$$y(0) = 2,\ D(y)(0) = -3,\ D^{(2)}(y)(0) = 5 \tag{18}$$

> $Sistema := eval(subs(t=0, rhs(SolucionGeneral) = rhs(Condiciones_1))), eval(subs(t=0,$
> $rhs(diff(SolucionGeneral, t)) = rhs(Condiciones_2))), eval(subs(t=0,$
> $rhs(diff(SolucionGeneral, t\$2)) = rhs(Condiciones_3))) : Sistema_1; Sistema_2; Sistema_3$

$$2 + C_1 + C_2 = 2$$

$$4 + C_1 + C_2 + C_3 = -3$$

$$8 + C_1 + 2\,C_3 = 5 \tag{19}$$

> $Parametro := solve(\{Sistema\}, \{C_1, C_2, C_3\})$

$$Parametro := \{C_1 = 11, C_2 = -11, C_3 = -7\} \tag{20}$$

> $SolucionParticular := subs(C_1 = rhs(Parametro_1), C_2 = rhs(Parametro_2), C_3$
> $= rhs(Parametro_3), SolucionGeneral)$

$$SolucionParticular := y(t) = 2\left(e^t\right)^2 + 11\,e^t - 11\,e^t \cos(t) - 7\,e^t \sin(t) \tag{21}$$

> $SolPart := dsolve(\{Ecuacion, Condiciones\})$

$$SolPart := y(t) = 2\left(e^t\right)^2 + 11\,e^t - 11\,e^t \cos(t) - 7\,e^t \sin(t) \tag{22}$$

> $plot([rhs(SolucionParticular), rhs(diff(SolucionParticular, t)), rhs(diff(SolucionParticular,$
> $t\$2))], t = 0\,..0.4, color = [red, blue, brown])$