```
> restart
> Ecuacion := diff(x(t), t$3) - diff(x(t), t$2) - 14·diff(x(t), t) + 24·x(t) = 14·exp(3 t)
```

$$Ecuacion := \frac{d^3}{dt^3} x(t) - \left(\frac{d^2}{dt^2} x(t) \right) - 14 \left(\frac{d}{dt} x(t) \right) + 24\, x(t) = 14\, e^{3t} \tag{1}$$

```
> Condiciones := x(0) = 9, D(x)(0) = 12, D(D(x))(0) = 92
```

$$Condiciones := x(0) = 9,\ D(x)(0) = 12,\ D^{(2)}(x)(0) = 92 \tag{2}$$

```
>
1)
> EcuacionHom := lhs(Ecuacion) = 0
```

$$EcuacionHom := \frac{d^3}{dt^3} x(t) - \left(\frac{d^2}{dt^2} x(t) \right) - 14 \left(\frac{d}{dt} x(t) \right) + 24\, x(t) = 0 \tag{3}$$

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

$$Q := 14\, e^{3t} \tag{4}$$

```
> EcuaCaract := m··3 - m··2 - 14·m + 24 = 0
```

$$EcuaCaract := m^3 - m^2 - 14\, m + 24 = 0 \tag{5}$$

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

$$Raiz := -4, 2, 3 \tag{6}$$

```
> SolUno := x(t) = exp(Raiz[1]·t); SolDos := x(t) = exp(Raiz[2]·t); SolTres := x(t) = exp(Raiz[3]
  ·t);
```

$$SolUno := x(t) = e^{-4t}$$

$$SolDos := x(t) = e^{2t}$$

$$SolTres := x(t) = e^{3t} \tag{7}$$

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

$$WW := \begin{bmatrix} e^{-4t} & e^{2t} & e^{3t} \\ -4\, e^{-4t} & 2\, e^{2t} & 3\, e^{3t} \\ 16\, e^{-4t} & 4\, e^{2t} & 9\, e^{3t} \end{bmatrix} \tag{8}$$

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

$$BB := \begin{bmatrix} 0 & 0 & 14\, e^{3t} \end{bmatrix} \tag{9}$$

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

$$SOL := \begin{bmatrix} \frac{1}{3} e^{7t} & -\frac{7}{3} e^{t} & 2 \end{bmatrix} \tag{10}$$

```
> Aprima := SOL[1]; Bprima := SOL[2]; Eprima := SOL[3]
```

$$Aprima := \frac{1}{3} e^{7t}$$

$$Bprima := -\frac{7}{3} e^{t}$$

$$Eprima := 2 \tag{11}$$

```
> A := int(Aprima, t) + C1; B := int(Bprima, t) + C2; E := int(Eprima, t) + C3
```

$$A := \frac{1}{21}\, e^{7t} + C_1$$

$$B := -\frac{7}{3}\, e^{t} + C_2$$

$$E := 2\,t + C_3 \tag{12}$$

```
> SolucionNoHom := simplify(x(t) = A·rhs(SolUno) + B·rhs(SolDos) + E·rhs(SolTres))
```

$$SolucionNoHom := x(t) = -\frac{16}{7}\, e^{3t} + e^{-4t} C_1 + e^{2t} C_2 + 2\, e^{3t} t + e^{3t} C_3 \tag{13}$$

```
>
```

2)

```
> Parametros := simplify(solve({subs(t = 0, rhs(SolucionNoHom) = rhs(Condiciones1)),
    subs(t = 0, rhs(diff(SolucionNoHom, t)) = rhs(Condiciones2)), subs(t = 0,
    rhs(diff(SolucionNoHom, t$2)) = rhs(Condiciones3))}, {C1, C2, C3}))
```

$$Parametros := \left\{C_1 = 2,\ C_2 = 3,\ C_3 = \frac{44}{7}\right\} \tag{14}$$

```
> SolucionParticular := simplify(subs(C1 = rhs(Parametros1), C2 = rhs(Parametros2), C3
    = rhs(Parametros3), SolucionNoHom))
```

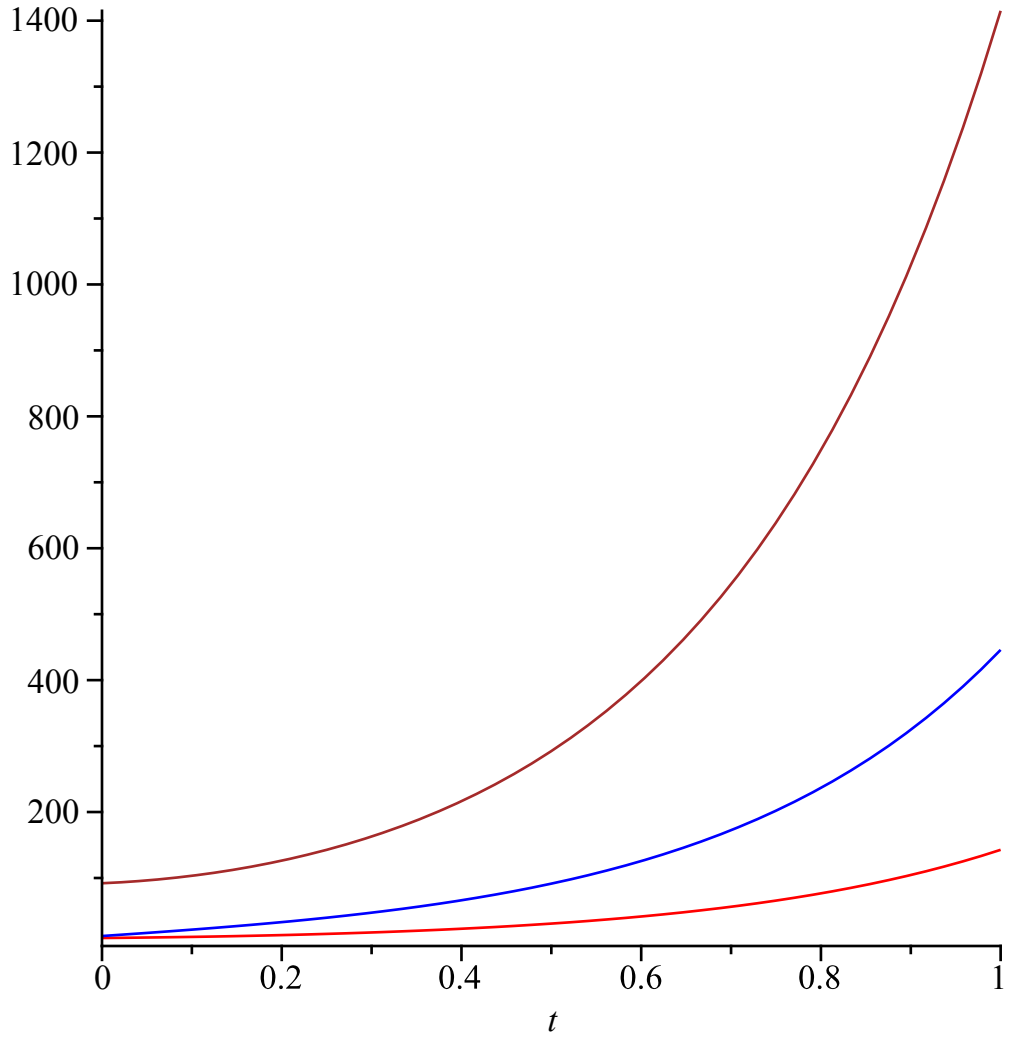
$$SolucionParticular := x(t) = 4\, e^{3t} + 2\, e^{-4t} + 3\, e^{2t} + 2\, e^{3t} t \tag{15}$$

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

$$SolPart := x(t) = 2\, \left(e^{t}\right)^{3} t + 2\, e^{-4t} + 3\, e^{2t} + 4\, e^{3t} \tag{16}$$

3)

```
> plot([rhs(SolucionParticular), rhs(diff(SolucionParticular, t)), rhs(diff(SolucionParticular,
    t$2))], t = 0..1, color = [red, blue, brown])
```


1400
1200
1000
800
600
400
200
0
0.2
0.4
0.6
0.8
1
t