```
> restart
> SolucionGeneral := y(x) = C1·exp(2 x) + C2·exp(-2 x) + C3·x·exp(-2 x) + C4·exp(5 x)
      ·cos(3 x) + C5·exp(5 x)·sin(3 x)
```

$$SolucionGeneral := y(x) = C_1 e^{2x} + C_2 e^{-2x} + C_3 x e^{-2x} + C_4 e^{5x}\cos(3x) + C_5 e^{5x}\sin(3x) \quad (1)$$

```
> EcuacionCaracteristica := expand((m - 2)·(m + 2)^2·(m - (5 + 3·I))·(m - (5 - 3·I)))
      = 0
```

$$EcuacionCaracteristica := m^5 - 8m^4 - 272 + 10m^3 + 100m^2 - 56m = 0 \quad (2)$$

```
> EcuacionDiferencial := diff(y(x), x$5) - 8·diff(y(x), x$4) + 10·diff(y(x), x$3) + 100
      ·diff(y(x), x$2) - 56·diff(y(x), x) - 272·y(x) = 0
```

$$EcuacionDiferencial := \frac{d^5}{dx^5}y(x) - 8\left(\frac{d^4}{dx^4}y(x)\right) + 10\left(\frac{d^3}{dx^3}y(x)\right) + 100\left(\frac{d^2}{dx^2}y(x)\right) - 56\left(\frac{d}{dx}y(x)\right) - 272\,y(x) = 0 \quad (3)$$

```
> SolGral := dsolve(EcuacionDiferencial)
```

$$SolGral := y(x) = \_C1\, e^{2x} + \_C2\, e^{-2x} + \_C3\, e^{-2x}x + \_C4\, e^{5x}\sin(3x) + \_C5\, e^{5x}\cos(3x) \quad (4)$$

```
> restart
> Solucion := y(x) = C1·x·exp(2 x) + C2·x^2·exp(2 x)
```

$$Solucion := y(x) = C_1 x e^{2x} + C_2 x^2 e^{2x} \quad (5)$$

```
> Sistema := diff(Solucion, x), diff(Solucion, x$2) : Sistema1; Sistema2
```

$$\frac{d}{dx}y(x) = C_1 e^{2x} + 2C_1 x e^{2x} + 2C_2 x e^{2x} + 2C_2 x^2 e^{2x}$$

$$\frac{d^2}{dx^2}y(x) = 4C_1 e^{2x} + 4C_1 x e^{2x} + 2C_2 e^{2x} + 8C_2 x e^{2x} + 4C_2 x^2 e^{2x} \quad (6)$$

```
> Parametro := solve({Sistema}, {C1, C2}) : Parametro1; Parametro2
```

$$C_1 = \frac{-\left(\frac{d^2}{dx^2}y(x)\right)x^2 + 2\left(\frac{d}{dx}y(x)\right)x^2 - \left(\frac{d^2}{dx^2}y(x)\right)x + 4\left(\frac{d}{dx}y(x)\right)x + \frac{d}{dx}y(x)}{e^{2x}(2x + 2x^2 + 1)}$$

$$C_2 = -\frac{1}{2}\,\frac{-\left(\frac{d^2}{dx^2}y(x)\right) - 2\left(\frac{d^2}{dx^2}y(x)\right)x + 4\left(\frac{d}{dx}y(x)\right) + 4\left(\frac{d}{dx}y(x)\right)x}{e^{2x}(2x + 2x^2 + 1)} \quad (7)$$

```
> EcuacionInicial := simplify(subs(C1 = rhs(Parametro1), C2 = rhs(Parametro2), Solucion))
```

$$EcuacionInicial := y(x) = \frac{1}{2}\,\frac{x\left(-\left(\frac{d^2}{dx^2}y(x)\right)x + 4\left(\frac{d}{dx}y(x)\right)x + 2\left(\frac{d}{dx}y(x)\right)\right)}{2x + 2x^2 + 1} \quad (8)$$

```
> EcuacionIntermedio := expand(lhs(EcuacionInicial)·2·(2 x + 2 x^2 + 1)
      - rhs(EcuacionInicial)·2·(2 x + 2 x^2 + 1)) = 0
```

$$EcuacionIntermedio := 4y(x)x + 4y(x)x^2 + 2y(x) + \left(\frac{d^2}{dx^2}y(x)\right)x^2 - 4\left(\frac{d}{dx}y(x)\right)x^2 \quad (9)$$

$$-2\left(\frac{d}{dx}y(x)\right)x=0$$

> $EcuacionFinal := expand\left(\frac{lhs(EcuacionIntermedio)}{x^2}\right)=0$

$$EcuacionFinal := \frac{4\,y(x)}{x}+4\,y(x)+\frac{2\,y(x)}{x^2}+\frac{d^2}{dx^2}y(x)-4\left(\frac{d}{dx}y(x)\right)-\frac{2\left(\frac{d}{dx}y(x)\right)}{x}=0 \quad (10)$$

> $Sol_1 := dsolve(EcuacionFinal)$

$$Sol_1 := y(x) = \_C1\,x\,e^{2x}+\_C2\,x^2\,e^{2x} \quad (11)$$

> $Ecuacion := diff(y(x), x\$2)-\left(4+\frac{2}{x}\right)\cdot diff(y(x), x)+\left(\frac{2}{x^2}+\frac{4}{x}+4\right)\cdot y(x)=0$

$$Ecuacion := \frac{d^2}{dx^2}y(x)-\left(4+\frac{2}{x}\right)\left(\frac{d}{dx}y(x)\right)+\left(\frac{2}{x^2}+\frac{4}{x}+4\right)y(x)=0 \quad (12)$$

> $Sol_2 := dsolve(Ecuacion)$

$$Sol_2 := y(x) = \_C1\,x\,e^{2x}+\_C2\,x^2\,e^{2x} \quad (13)$$

>