

```
> restart
> SolucionGeneral := y(x) = C1·exp(3·x) + C2·exp(-3·x) + C3·exp(3·x)·x + C4·exp(-3·x)·x
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$$\text{SolucionGeneral} := y(x) = C_1 e^{3x} + C_2 e^{-3x} + C_3 e^{3x} x + C_4 e^{-3x} x \quad (1)$$

```
> with(linalg) :
> ?wronskian
```

```
> WW := wronskian([exp(3·x), exp(-3·x), exp(3·x)·x, exp(-3·x)·x], x);
```

$$WW := \begin{bmatrix} e^{3x} & e^{-3x} & e^{3x}x & e^{-3x}x \\ 3e^{3x} & -3e^{-3x} & 3e^{3x}x + e^{3x} & -3e^{-3x}x + e^{-3x} \\ 9e^{3x} & 9e^{-3x} & 9e^{3x}x + 6e^{3x} & 9e^{-3x}x - 6e^{-3x} \\ 27e^{3x} & -27e^{-3x} & 27e^{3x}x + 27e^{3x} & -27e^{-3x}x + 27e^{-3x} \end{bmatrix} \quad (2)$$

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> DetWW := det(WW)
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$$\text{DetWW} := -1296 (e^{3x})^2 (e^{-3x})^2 \quad (3)$$

```
> WWW := wronskian([4·cos(2·x), -16·cos(2·x)], x)
```

$$WWW := \begin{bmatrix} 4 \cos(2x) & -16 \cos(2x) \\ -8 \sin(2x) & 32 \sin(2x) \end{bmatrix} \quad (4)$$

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> DetWWW := det(WWW)
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$$\text{DetWWW} := 0 \quad (5)$$

```
> restart
```

```
> SolucionGeneral := y(x) = C1·exp(3·x) + C2 + C3·x
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$$\text{SolucionGeneral} := y(x) = C_1 e^{3x} + C_2 + C_3 x \quad (6)$$

```
> Condiciones := y(0) = 4, D(y)(0) = -2, D(D(y))(0) = 8;
```

$$\text{Condiciones} := y(0) = 4, D(y)(0) = -2, D^{(2)}(y)(0) = 8 \quad (7)$$

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> Sistema := subs(x=0, rhs(SolucionGeneral) = 4), subs(x=0, rhs(diff(SolucionGeneral, x)) = -2), subs(x=0, rhs(diff(SolucionGeneral, x$2)) = 8) : Sistema1; Sistema2; Sistema3;
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$$\begin{aligned} C_1 + C_2 &= 4 \\ 3C_1 + C_3 &= -2 \\ 9C_1 &= 8 \end{aligned} \quad (8)$$

```
> Parametro := solve({Sistema}, {C1, C2, C3})
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$$\text{Parametro} := \left\{ C_1 = \frac{8}{9}, C_2 = \frac{28}{9}, C_3 = -\frac{14}{3} \right\} \quad (9)$$

```
> SolucionParticular := subs(C1 = rhs(Parametro1), C2 = rhs(Parametro2), C3 = rhs(Parametro3), SolucionGeneral)
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$$\text{SolucionParticular} := y(x) = \frac{8}{9} e^{3x} + \frac{28}{9} - \frac{14}{3} x \quad (10)$$

```
> restart
```

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>
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$$2y(y' + 2) - xy'^2 = 0.$$

$$\begin{aligned} > \text{Ecuacion} := 2 \cdot y(x) \cdot (\text{diff}(y(x), x) + 2) - x \cdot (\text{diff}(y(x), x)) \cdot 2 = 0 \\ & \text{Ecuacion} := 2 y(x) \left(\frac{d}{dx} y(x) + 2 \right) - x \left(\frac{d}{dx} y(x) \right)^2 = 0 \end{aligned} \quad (11)$$

$$> Cy - (C - x^2) = 0,$$

$$\begin{aligned} > \text{SolucionGeneral} := C_1 \cdot y(x) - (C_1 - x) \cdot 2 = 0 \\ & \text{SolucionGeneral} := C_1 y(x) - (C_1 - x)^2 = 0 \end{aligned} \quad (12)$$

$$\begin{aligned} > \text{Solucion} := \text{isolate}(\text{SolucionGeneral}, y(x)) \\ & \text{Solucion} := y(x) = \frac{(C_1 - x)^2}{C_1} \end{aligned} \quad (13)$$

$$\begin{aligned} > \text{Comprobacion}_1 := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{Solucion}), \text{Ecuacion}))) \\ & \text{Comprobacion}_1 := 0 = 0 \end{aligned} \quad (14)$$

$$\begin{aligned} > \text{SolucionParticular} := \text{subs}(C_1 = 4, \text{Solucion}) \\ & \text{SolucionParticular} := y(x) = \frac{1}{4} (4 - x)^2 \end{aligned} \quad (15)$$

$$\begin{aligned} > \text{SolucionSingular} := y(x) = -4 \cdot x \\ & \text{SolucionSingular} := y(x) = -4 x \end{aligned} \quad (16)$$

$$\begin{aligned} > \text{Comprobacion}_2 := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{SolucionSingular}), \text{Ecuacion}))) \\ & \text{Comprobacion}_2 := 0 = 0 \end{aligned} \quad (17)$$

$$\begin{aligned} > \text{Comprobacion}_3 := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{SolucionParticular}), \text{Ecuacion}))) \\ & \text{Comprobacion}_3 := 0 = 0 \end{aligned} \quad (18)$$

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