

> restart

> SolGral := y(x) = C₁·exp(3 x)·cos(3 x) + C₂·exp(3 x)·sin(3 x) + C₃·x·exp(3 x)·cos(3·x)
+ C₄·x·exp(3 x)·sin(3 x)

$$\text{SolGral} := y(x) = C_1 e^{3x} \cos(3x) + C_2 e^{3x} \sin(3x) + C_3 x e^{3x} \cos(3x) + C_4 x e^{3x} \sin(3x) \quad (1)$$

>

E.D.O.(4).L.cc.H

> Ecuacarac := expand((m - (3 + 3 I))·2·(m - (3 - 3 I))·2) = 0

$$\text{Ecuacarac} := m^4 - 12 m^3 + 324 + 72 m^2 - 216 m = 0 \quad (2)$$

> EcuacionDiferencial := y'''' - 12·y''' + 72·y'' - 216·y' + 324·y = 0

$$\begin{aligned} \text{EcuacionDiferencial} := & \frac{d^4}{dx^4} y(x) - 12 \left(\frac{d^3}{dx^3} y(x) \right) + 72 \left(\frac{d^2}{dx^2} y(x) \right) - 216 \left(\frac{d}{dx} y(x) \right) \\ & + 324 y(x) = 0 \end{aligned} \quad (3)$$

> Comprobacion := eval(subs(y(x) = rhs(SolGral), EcuacionDiferencial))

$$\text{Comprobacion} := 0 = 0 \quad (4)$$

> SolucionGeneral := dsolve(EcuacionDiferencial)

$$\begin{aligned} \text{SolucionGeneral} := & y(x) = _C1 e^{3x} \sin(3x) + _C2 e^{3x} \cos(3x) + _C3 e^{3x} \sin(3x) x \\ & + _C4 e^{3x} \cos(3x) x \end{aligned} \quad (5)$$

> restart

> SolGral := y(x) = C₁·x·exp(2 x) + C₂·x·2·exp(2 x) + C₃·x·3·exp(2 x)

$$\text{SolGral} := y(x) = C_1 x e^{2x} + C_2 x^2 e^{2x} + C_3 x^3 e^{2x} \quad (6)$$

> Sistema := diff(SolGral, x), diff(SolGral, x\$2), diff(SolGral, x\$3) : Sistema₁; Sistema₂;
Sistema₃

$$\frac{d}{dx} y(x) = C_1 e^{2x} + 2 C_1 x e^{2x} + 2 C_2 x e^{2x} + 2 C_2 x^2 e^{2x} + 3 C_3 x^2 e^{2x} + 2 C_3 x^3 e^{2x}$$

$$\begin{aligned} \frac{d^2}{dx^2} y(x) = & 4 C_1 e^{2x} + 4 C_1 x e^{2x} + 2 C_2 e^{2x} + 8 C_2 x e^{2x} + 4 C_2 x^2 e^{2x} + 6 C_3 x e^{2x} \\ & + 12 C_3 x^2 e^{2x} + 4 C_3 x^3 e^{2x} \end{aligned}$$

$$\begin{aligned} \frac{d^3}{dx^3} y(x) = & 12 C_1 e^{2x} + 8 C_1 x e^{2x} + 12 C_2 e^{2x} + 24 C_2 x e^{2x} + 8 C_2 x^2 e^{2x} + 6 C_3 e^{2x} \\ & + 36 C_3 x e^{2x} + 36 C_3 x^2 e^{2x} + 8 C_3 x^3 e^{2x} \end{aligned} \quad (7)$$

> Parametro := solve({Sistema}, {C₁, C₂, C₃}) : Parametro₁

$$\begin{aligned} C_1 = & \frac{1}{2} \frac{1}{(4x^3 + 6x^2 + 6x + 3) e^{2x}} \left(-8x^4 \left(\frac{d^2}{dx^2} y(x) \right) + 8x^4 \left(\frac{d}{dx} y(x) \right) \right. \\ & + 2x^4 \left(\frac{d^3}{dx^3} y(x) \right) - 24x^3 \left(\frac{d^2}{dx^2} y(x) \right) + 4 \left(\frac{d^3}{dx^3} y(x) \right) x^3 + 32x^3 \left(\frac{d}{dx} y(x) \right) \\ & \left. - 24 \left(\frac{d^2}{dx^2} y(x) \right) x^2 + 48 \left(\frac{d}{dx} y(x) \right) x^2 + 3 \left(\frac{d^3}{dx^3} y(x) \right) x^2 - 6 \left(\frac{d^2}{dx^2} y(x) \right) x \right) \end{aligned} \quad (8)$$

$$+ 24 \left(\frac{d}{dx} y(x) \right) x + 6 \left(\frac{d}{dx} y(x) \right) \Bigg)$$

> *EcuacionInicial* := expand(simplify(subs($C_1 = \text{rhs}(\text{Parametro}_1)$), $C_2 = \text{rhs}(\text{Parametro}_2)$), $C_3 = \text{rhs}(\text{Parametro}_3)$, SolGral)));

$$\begin{aligned} \text{EcuacionInicial} := y(x) = & \frac{3x \left(\frac{d}{dx} y(x) \right)}{4x^3 + 6x^2 + 6x + 3} - \frac{3}{2} \frac{x^2 \left(\frac{d^2}{dx^2} y(x) \right)}{4x^3 + 6x^2 + 6x + 3} \\ & + \frac{6x^2 \left(\frac{d}{dx} y(x) \right)}{4x^3 + 6x^2 + 6x + 3} - \frac{3x^3 \left(\frac{d^2}{dx^2} y(x) \right)}{4x^3 + 6x^2 + 6x + 3} + \frac{6x^3 \left(\frac{d}{dx} y(x) \right)}{4x^3 + 6x^2 + 6x + 3} \\ & + \frac{1}{2} \frac{x^3 \left(\frac{d^3}{dx^3} y(x) \right)}{4x^3 + 6x^2 + 6x + 3} \end{aligned} \quad (9)$$

> *EcuacionFinal* := simplify(lhs(*EcuacionInicial*) · ($4x^3 + 6x^2 + 6x + 3$) − rhs(*EcuacionInicial*) · ($4x^3 + 6x^2 + 6x + 3$)) = 0

$$\begin{aligned} \text{EcuacionFinal} := & 4y(x)x^3 + 6y(x)x^2 + 6y(x)x + 3y(x) - 3 \left(\frac{d}{dx} y(x) \right) x \\ & + \frac{3}{2} \left(\frac{d^2}{dx^2} y(x) \right) x^2 - 6 \left(\frac{d}{dx} y(x) \right) x^2 + 3x^3 \left(\frac{d^2}{dx^2} y(x) \right) - 6x^3 \left(\frac{d}{dx} y(x) \right) \\ & - \frac{1}{2} \left(\frac{d^3}{dx^3} y(x) \right) x^3 = 0 \end{aligned} \quad (10)$$

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