

> restart

> Ecuacion := y'' + y' + y = 0

$$Ecuacion := \frac{d^2}{dx^2} y(x) + \frac{d}{dx} y(x) + y(x) = 0 \quad (1)$$

> EcuaCarac := m·2 + m + 1 = 0

$$EcuaCarac := m^2 + m + 1 = 0 \quad (2)$$

> Raiz := solve(EcuaCarac); evalf(%, 2)

$$Raiz := -\frac{1}{2} + \frac{1}{2} I\sqrt{3}, -\frac{1}{2} - \frac{1}{2} I\sqrt{3} \\ -0.50 + 0.85 I, -0.50 - 0.85 I \quad (3)$$

> SolUno := y(x) = exp(Re(Raiz₁)·x)·cos(Im(Raiz₁)·x)

$$SolUno := y(x) = e^{-\frac{1}{2}x} \cos\left(\frac{1}{2}\sqrt{3}x\right) \quad (4)$$

> SolDos := y(x) = exp(Re(Raiz₁)·x)·sin(Im(Raiz₁)·x)

$$SolDos := y(x) = e^{-\frac{1}{2}x} \sin\left(\frac{1}{2}\sqrt{3}x\right) \quad (5)$$

> SolucionGeneral := y(x) = C₁·rhs(SolUno) + C₂·rhs(SolDos)

$$SolucionGeneral := y(x) = C_1 e^{-\frac{1}{2}x} \cos\left(\frac{1}{2}\sqrt{3}x\right) + C_2 e^{-\frac{1}{2}x} \sin\left(\frac{1}{2}\sqrt{3}x\right) \quad (6)$$

> with(linalg) :

> WW := wronskian([rhs(SolUno), rhs(SolDos)], x) :

> Comprobacion₁ := simplify(det(WW)) ≠ 0

$$Comprobacion_1 := \frac{1}{2} e^{-x} \sqrt{3} \neq 0 \quad (7)$$

> Comprobacion₂ := simplify(eval(subs(y(x) = rhs(SolucionGeneral), Ecuacion)))

$$Comprobacion_2 := 0 = 0 \quad (8)$$

> Ecuacion

$$\frac{d^2}{dx^2} y(x) + \frac{d}{dx} y(x) + y(x) = 0 \quad (9)$$

> restart

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$$= C_1 e^{-2x} \cos(3x) + C_2 e^{-2x} \sin(3x) + C_3 x e^{-2x} \cos(3x) + C_4 x e^{-2x} \sin(3x)$$

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

$$EcuacionCaracteristica := m^4 + 8m^3 + 169m^2 + 104m = 0 \quad (10)$$

> y'''' + 8y''' + 42y'' + 104y' + 169y = 0

$$\frac{d^4}{dx^4} y(x) + 8 \left(\frac{d^3}{dx^3} y(x) \right) + 42 \left(\frac{d^2}{dx^2} y(x) \right) + 104 \left(\frac{d}{dx} y(x) \right) + 169 y(x) = 0 \quad (11)$$

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> Solucion := dsolve(%)
Solucion := y(x) = _C1 e-2x sin(3 x) + _C2 e-2x cos(3 x) + _C3 e-2x sin(3 x) x
               + _C4 e-2x cos(3 x) x
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(12)