

$$\begin{aligned} &> \text{restart} \\ &> \text{Ecuacion} := (y(x) + \sqrt{y(x) \cdot 2 - x \cdot 2}) - x \cdot \text{diff}(y(x), x) = 0 \\ &\quad \text{Ecuacion} := y(x) + \sqrt{y(x)^2 - x^2} - x \left( \frac{d}{dx} y(x) \right) = 0 \end{aligned} \quad (1)$$

$$\begin{aligned} &> \text{with(DEtools)} : \\ &> \text{odeadvisor(Ecuacion)} \\ &\quad [[_{\text{homogeneous}}, \text{class } A], _{\text{rational}}, _{\text{dAlembert}}] \end{aligned} \quad (2)$$

$$\begin{aligned} &> \text{EcuacionDos} := \text{simplify}(\text{eval}(\text{subs}(y(x) = u(x) \cdot x, \text{Ecuacion}))) \\ &\quad \text{EcuacionDos} := \sqrt{x^2 (u(x)^2 - 1)} - \left( \frac{d}{dx} u(x) \right) x^2 = 0 \end{aligned} \quad (3)$$

$$\begin{aligned} &> M := x \cdot \sqrt{u \cdot 2 - 1} \\ &\quad M := x \sqrt{u^2 - 1} \end{aligned} \quad (4)$$

$$\begin{aligned} &> N := -x \cdot 2 \\ &\quad N := -x^2 \end{aligned} \quad (5)$$

$$\begin{aligned} &> P := x; Q := \sqrt{u \cdot 2 - 1}; R := x \cdot 2; S := -1 \\ &\quad P := x \\ &\quad Q := \sqrt{u^2 - 1} \\ &\quad R := x^2 \\ &\quad S := -1 \end{aligned} \quad (6)$$

$$\begin{aligned} &> \text{SolucionIntermedia} := \text{int}\left(\frac{P}{R}, x\right) + \text{int}\left(\frac{S}{Q}, u\right) = C_1 \\ &\quad \text{SolucionIntermedia} := \ln(x) - \ln(u + \sqrt{u^2 - 1}) = C_1 \end{aligned} \quad (7)$$

$$\begin{aligned} &> \text{SolucionDos} := \text{subs}\left(u = \frac{y}{x}, \text{SolucionIntermedia}\right) \\ &\quad \text{SolucionDos} := \ln(x) - \ln\left(\frac{y}{x} + \sqrt{\frac{y^2}{x^2} - 1}\right) = C_1 \end{aligned} \quad (8)$$

$$\begin{aligned} &> \text{SolucionGeneral} := \text{expand}(\text{simplify}(\exp(\text{lhs}(\text{SolucionDos})))) = C_{10} \\ &\quad \text{SolucionGeneral} := \frac{x^2}{y + \sqrt{\frac{y^2}{x^2} - 1} x} = C_{10} \end{aligned} \quad (9)$$

$$\begin{aligned} &> \text{Solucion} := \frac{x^2}{y(x) + \sqrt{\frac{y(x)^2}{x^2} - 1} x} = C_{10} \\ &\quad \text{Solucion} := \frac{x^2}{y(x) + \sqrt{\frac{y(x)^2}{x^2} - 1} x} = C_{10} \end{aligned} \quad (10)$$

$$\begin{aligned} &> \text{EcuacionTres} := \text{expand}(\text{isolate}(\text{simplify}(\text{diff}(\text{Solucion}, x)), \text{diff}(y(x), x))) \\ &\quad \text{EcuacionTres} := \text{expand}(\text{isolate}(\text{simplify}(\text{diff}(\text{Solucion}, x)), \text{diff}(y(x), x))) \end{aligned} \quad (11)$$

$$EcuacionTres := \frac{d}{dx} y(x) = \frac{y(x)}{x} + \sqrt{\frac{y(x)^2}{x^2} - 1} \quad (11)$$

$$> EcuacionTreinta := \left( lhs(EcuacionTres) - \frac{y(x)}{x} \right) \cdot 2 = \left( rhs(EcuacionTres) - \frac{y(x)}{x} \right) \cdot 2$$

$$EcuacionTreinta := \left( \frac{d}{dx} y(x) - \frac{y(x)}{x} \right)^2 = \frac{y(x)^2}{x^2} - 1 \quad (12)$$

$$> EcuacionTrescientos := lhs(EcuacionTreinta) \cdot x \cdot 2 = simplify(rhs(EcuacionTreinta) \cdot x \cdot 2)$$

$$EcuacionTrescientos := \left( \frac{d}{dx} y(x) - \frac{y(x)}{x} \right)^2 x^2 = y(x)^2 - x^2 \quad (13)$$

$$> Ecuacion;$$

$$y(x) + \sqrt{y(x)^2 - x^2} - x \left( \frac{d}{dx} y(x) \right) = 0 \quad (14)$$

$$> EcuacionCuatro := expand(isolate(Ecuacion, diff(y(x), x)))$$

$$EcuacionCuatro := \frac{d}{dx} y(x) = \frac{y(x)}{x} + \frac{\sqrt{y(x)^2 - x^2}}{x} \quad (15)$$

$$> EcuacionCuarenta := \left( lhs(EcuacionCuatro) - \frac{y(x)}{x} \right) \cdot 2 = \left( rhs(EcuacionCuatro) - \frac{y(x)}{x} \right) \cdot 2$$

$$EcuacionCuarenta := \left( \frac{d}{dx} y(x) - \frac{y(x)}{x} \right)^2 = \frac{y(x)^2 - x^2}{x^2} \quad (16)$$

$$> EcuacionCuatrocientos := lhs(EcuacionCuarenta) \cdot x \cdot 2 = simplify(rhs(EcuacionCuarenta) \cdot x \cdot 2)$$

$$EcuacionCuatrocientos := \left( \frac{d}{dx} y(x) - \frac{y(x)}{x} \right)^2 x^2 = y(x)^2 - x^2 \quad (17)$$

$$> comprobacion := simplify(lhs(EcuacionTrescientos) \cdot 2 - lhs(EcuacionCuatrocientos) \cdot 2) = 0$$

$$comprobacion := 0 = 0 \quad (18)$$

$$> SOL := dsolve(Ecuacion)$$

$$SOL := \frac{y(x)}{x^2} + \frac{\sqrt{y(x)^2 - x^2}}{x^2} - \frac{1}{x} = 0 \quad (19)$$

$$> SolucionDos$$

$$\ln(x) - \ln\left(\frac{y}{x} + \sqrt{\frac{y^2}{x^2} - 1}\right) = C_1 \quad (20)$$

$$> SolucionGeneral$$

$$\frac{x^2}{y + \sqrt{\frac{y^2}{x^2} - 1} x} = C_{10} \quad (21)$$

$$> restart$$

$$2 \cdot y(x) \cdot \left( \frac{dy}{dx} + 2 \right) - x \left( \frac{dy}{dx} \right)^2 = 0$$

> Ecuacion := 2\*y(x)\*(diff(y(x),x) + 2) - x\*diff(y(x),x)^2 = 0

$$Ecuacion := 2 y(x) \left( \frac{d}{dx} y(x) + 2 \right) - x \left( \frac{d}{dx} y(x) \right)^2 = 0 \quad (22)$$

> with(DEtools) :

> odeadvisor(Ecuacion)

$$[[_homogeneous, class A], _rational, _dAlembert] \quad (23)$$

> Ecua := isolate(Ecuacion, diff(y(x),x))

$$Ecua := \frac{d}{dx} y(x) = \frac{y(x) - \sqrt{y(x)^2 + 4 x y(x)}}{x} \quad (24)$$

> EcuaDos := eval(subs(y(x) = u(x)\*x, Ecua))

$$EcuaDos := \left( \frac{d}{dx} u(x) \right) x + u(x) = \frac{u(x) x - \sqrt{u(x)^2 x^2 + 4 x^2 u(x)}}{x} \quad (25)$$

> EcuaTres := simplify(lhs(EcuaDos) - rhs(EcuaDos)) = 0

$$EcuaTres := \frac{\left( \frac{d}{dx} u(x) \right) x^2 + \sqrt{u(x) x^2 (u(x) + 4)}}{x} = 0 \quad (26)$$

> Sol := dsolve(Ecuacion)

$$Sol := y(x) = 0, y(x) = -4 x, y(x) = \frac{1}{2} \frac{x (-x + 2 \_CI)^2}{\_CI^2 \left( -\frac{-x + 2 \_CI}{\_CI} + 2 \right)} \quad (27)$$

> SolSingUno := Sol<sub>1</sub>; SolSingDos := Sol<sub>2</sub>; SolGral := simplify(Sol<sub>3</sub>);

$$SolSingUno := y(x) = 0$$

$$SolSingDos := y(x) = -4 x$$

$$SolGral := y(x) = \frac{1}{2} \frac{(-x + 2 \_CI)^2}{\_CI} \quad (28)$$

> SolPart := subs(\_CI = 2, Sol<sub>3</sub>)

$$SolPart := y(x) = \frac{1}{4} (-x + 4)^2 \quad (29)$$

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> SolPartDos := subs(\_CI = -1, Sol<sub>3</sub>)

$$SolPartDos := y(x) = -\frac{1}{2} (-x - 2)^2 \quad (30)$$

> Sol<sub>2</sub>;

$$y(x) = -4 x \quad (31)$$

> Ecuacion;

(32)

$$2 y(x) \left( \frac{d}{dx} y(x) + 2 \right) - x \left( \frac{d}{dx} y(x) \right)^2 = 0 \quad (32)$$

$$\begin{aligned} &> \text{ComprobacionUno} := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{Sol}_3), \text{Ecuacion}))) \\ &\quad \text{ComprobacionUno} := 0 = 0 \end{aligned} \quad (33)$$

$$\begin{aligned} &> \text{ComprobacionDos} := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{Sol}_2), \text{Ecuacion}))) \\ &\quad \text{ComprobacionDos} := 0 = 0 \end{aligned} \quad (34)$$

$$\begin{aligned} &> \text{ComprobacionTres} := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{Sol}_1), \text{Ecuacion}))) \\ &\quad \text{ComprobacionTres} := 0 = 0 \end{aligned} \quad (35)$$

$$\begin{aligned} &> \text{ComprobacionCuatro} := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{SolPart}), \text{Ecuacion}))) \\ &\quad \text{ComprobacionCuatro} := 0 = 0 \end{aligned} \quad (36)$$

$$\begin{aligned} &> \text{ComprobacionCinco} := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{SolPartDos}), \text{Ecuacion}))) \\ &\quad \text{ComprobacionCinco} := 0 = 0 \end{aligned} \quad (37)$$

$$\begin{aligned} &> \text{ParametroUno} := \text{solve}(\text{rhs}(\text{SolPart}) = \text{rhs}(\text{SolGral}), \_C1) \\ &\quad \text{ParametroUno} := 2, \frac{1}{8} x^2 \end{aligned} \quad (38)$$

$$\begin{aligned} &> \text{ParametroDos} := \text{solve}(\text{rhs}(\text{SolPartDos}) = \text{rhs}(\text{SolGral}), \_C1) \\ &\quad \text{ParametroDos} := -1, -\frac{1}{4} x^2 \end{aligned} \quad (39)$$

$$\begin{aligned} &> \text{ParametroTres} := \text{solve}(\text{rhs}(\text{SolSingUno}) = \text{rhs}(\text{SolGral}), \_C1) \\ &\quad \text{ParametroTres} := \frac{1}{2} x, \frac{1}{2} x \end{aligned} \quad (40)$$

$$\begin{aligned} &> \text{ParametroCuatro} := \text{solve}(\text{rhs}(\text{SolSingDos}) = \text{rhs}(\text{SolGral}), \_C1) \\ &\quad \text{ParametroCuatro} := -\frac{1}{2} x, -\frac{1}{2} x \end{aligned} \quad (41)$$

$$\begin{aligned} &> \text{SolPart}, \text{SolPartDos}, \text{SolSingUno}, \text{SolSingDos}, \text{SolGral}; \\ &\quad y(x) = \frac{1}{4} (-x + 4)^2 \\ &\quad y(x) = -\frac{1}{2} (-x - 2)^2 \\ &\quad y(x) = 0 \\ &\quad y(x) = -4x \\ &\quad y(x) = \frac{1}{2} \frac{(-x + 2\_C1)^2}{\_C1} \end{aligned} \quad (42)$$