

> restart :

C1:

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$$x \left( \frac{dy}{dx} \right)^2 - 2y \cdot \left( \frac{dy}{dx} \right) + 4x = 0$$

> Ecuacion := x · (diff(y(x), x)) · 2 - 2 · y(x) · diff(y(x), x) + 4 · x = 0;

$$Ecuacion := x \left( \frac{d}{dx} y(x) \right)^2 - 2 y(x) \left( \frac{d}{dx} y(x) \right) + 4 x = 0 \quad (1)$$

> Solucion := dsolve(Ecuacion);

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

> SolucionSingular1 := Solucion<sub>1</sub>;

$$SolucionSingular1 := y(x) = -2 x \quad (3)$$

> SolucionSingular2 := Solucion<sub>2</sub>;

$$SolucionSingular2 := y(x) = 2 x \quad (4)$$

> SolucionGeneral := expand(Solucion<sub>3</sub>);

$$SolucionGeneral := y(x) = \frac{1}{2} \frac{x^2}{_CI} + 2 _CI \quad (5)$$

> EcuacionAlgebraica1 := rhs(SolucionSingular1) = rhs(SolucionGeneral);

$$EcuacionAlgebraica1 := -2 x = \frac{1}{2} \frac{x^2}{_CI} + 2 _CI \quad (6)$$

> Parametro := solve(EcuacionAlgebraica1, \_CI);

$$Parametro := -\frac{1}{2} x, -\frac{1}{2} x \quad (7)$$

> SolucionParticular1 := y(x) = x · 2 + 1;

$$SolucionParticular1 := y(x) = x^2 + 1 \quad (8)$$

> EcuacionAlgebraica2 := rhs(SolucionParticular1) = rhs(SolucionGeneral);

$$EcuacionAlgebraica2 := x^2 + 1 = \frac{1}{2} \frac{x^2}{_CI} + 2 _CI \quad (9)$$

> Parametro2 := solve(EcuacionAlgebraica2, \_CI);

$$Parametro2 := \frac{1}{2}, \frac{1}{2} x^2 \quad (10)$$

> with(DEtools) :

> odeadvisor(Ecuacion);

$$[[_homogeneous, class A], _rational, _dAlembert] \quad (11)$$

> EcuacionSeparada := expand(eval(subs(y(x) = u(x) · x, Ecuacion)) );

(12)

$$\text{EcuacionSeparada} := \left( \frac{d}{dx} u(x) \right)^2 x^3 - x u(x)^2 + 4 x = 0 \quad (12)$$

$$> \text{EcuacionIntermedia} := \text{simplify}(\text{isolate}(\text{EcuacionSeparada}, \text{diff}(u(x), x) \cdot 2));$$

$$\text{EcuacionIntermedia} := \left( \frac{d}{dx} u(x) \right)^2 = \frac{u(x)^2 - 4}{x^2} \quad (13)$$

$$> \text{SolucionGeneral} := \text{int}\left(\frac{1}{\text{sqrt}(u \cdot 2 - 4)}, u\right) - \text{int}\left(\frac{1}{x}, x\right) = C1;$$

$$\text{SolucionGeneral} := \ln(u + \sqrt{u^2 - 4}) - \ln(x) = C1 \quad (14)$$

$$> \text{SolucionFinal} := \text{simplify}\left(\text{subs}\left(u = \frac{y}{x}, \text{SolucionGeneral}\right)\right);$$

$$\text{SolucionFinal} := \ln\left(\frac{y + \sqrt{-\frac{y^2 + 4x^2}{x^2}} x}{x}\right) - \ln(x) = C1 \quad (15)$$

$$> \text{restart} :$$

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$$2xy \ln y + \left( x^2 + y^2 \sqrt{y^2 + 1} \right) \frac{dy}{dx} = 0$$

$$> \text{Ecuacion} := 2 \cdot x \cdot y(x) \cdot \log(y(x)) + (x \cdot 2 + y(x) \cdot 2 \cdot \text{sqrt}(y(x) \cdot 2 + 1)) \cdot \text{diff}(y(x), x) = 0;$$

$$\text{Ecuacion} := 2 x y(x) \ln(y(x)) + \left( x^2 + y(x)^2 \sqrt{y(x)^2 + 1} \right) \left( \frac{d}{dx} y(x) \right) = 0 \quad (16)$$

$$> \text{with}(\text{DEtools}) :$$

$$> \text{odeadvisor}(\text{Ecuacion});$$

$$[[\_1st\_order, \_with\_symmetry\_ [F(x)*G(y), 0]]] \quad (17)$$

$$> \text{intfactor}(\text{Ecuacion});$$

$$\frac{1}{y(x)} \quad (18)$$

$$> M(x, y) := 2 \cdot x \cdot y \cdot \log(y);$$

$$M(x, y) := 2 x y \ln(y) \quad (19)$$

$$> N(x, y) := x^2 + y^2 \sqrt{y^2 + 1};$$

$$N(x, y) := x^2 + y^2 \sqrt{y^2 + 1} \quad (20)$$

$$> \text{FacInt} := \frac{1}{y};$$

$$\text{FacInt} := \frac{1}{y} \quad (21)$$

$$> \text{MM}(x, y) := \text{simplify}(\text{FacInt} \cdot M(x, y));$$

$$\text{MM}(x, y) := 2 x \ln(y) \quad (22)$$

$$> \text{NN}(x, y) := \text{simplify}(\text{FacInt} \cdot N(x, y));$$

$$(23)$$

$$NN(x, y) := \frac{x^2 + y^2 \sqrt{y^2 + 1}}{y} \quad (23)$$

$$\begin{aligned} &> \text{comprobacion1} := \text{diff}(MM(x, y), y) - \text{diff}(NN(x, y), x) = 0; \\ &\text{comprobacion1} := 0 = 0 \end{aligned} \quad (24)$$

$$\begin{aligned} &> \text{IntMMx} := \text{int}(MM(x, y), x); \\ &\text{IntMMx} := x^2 \ln(y) \end{aligned} \quad (25)$$

$$\begin{aligned} &> \text{SolucionGeneral} := \text{IntMMx} + \text{int}((NN(x, y) - \text{diff}(\text{IntMMx}, y)), y) = C1; \\ &\text{SolucionGeneral} := x^2 \ln(y) + \frac{1}{3} (y^2 + 1)^{3/2} = C1 \end{aligned} \quad (26)$$

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