

> restart

>

$$(2xy^3 + 5y^4 - 18x^2y) + (3x^2y^2 + 20xy^3 - 6x^3 + 40y^4) \frac{dy}{dx} = 0$$

1 Nh

> EcuacionOriginal := 2·x·y(x)·3 + 5·y(x)·4 - 18·x·2·y(x) + (3·x·2·y(x)·2 + 20·x·y(x)·3 - 6·x·3 + 40·y(x)·4)·diff(y(x), x) = 0

$$EcuacionOriginal := 2xy(x)^3 + 5y(x)^4 - 18x^2y(x) + (3x^2y(x)^2 + 20xy(x)^3 - 6x^3 + 40y(x)^4) \left(\frac{d}{dx} y(x) \right) = 0 \quad (1)$$

> with(DEtools) :

> odeadvisor(EcuacionOriginal)

[_exact, _rational] (2)

> M := 2·x·y·3 + 5·y·4 - 18·x·2·y

$$M := 2xy^3 + 5y^4 - 18x^2y \quad (3)$$

> N := 3·x·2·y·2 + 20·x·y·3 - 6·x·3 + 40·y·4

$$N := 3x^2y^2 + 20xy^3 - 6x^3 + 40y^4 \quad (4)$$

> Comprobacion₁ := simplify(diff(M, y) - diff(N, x)) = 0

$$Comprobacion_1 := 0 = 0 \quad (5)$$

> IntMx := int(M, x)

$$IntMx := x^2y^3 + 5xy^4 - 6yx^3 \quad (6)$$

> IntNy := int(N, y)

$$IntNy := x^2y^3 + 5xy^4 - 6yx^3 + 8y^5 \quad (7)$$

> SolGral₁ := IntMx + int((N - diff(IntMx, y)), y) = C₁

$$SolGral_1 := x^2y^3 + 5xy^4 - 6yx^3 + 8y^5 = C_1 \quad (8)$$

> SolGral₂ := IntNy + int((M - diff(IntNy, x)), x) = C₁

$$SolGral_2 := x^2y^3 + 5xy^4 - 6yx^3 + 8y^5 = C_1 \quad (9)$$

> restart

> EcuacionOriginal := $\frac{x}{\sqrt{x \cdot 2 + y(x) \cdot 2}} + \frac{1}{x} + \frac{1}{y(x)} + \left(\frac{y(x)}{\sqrt{x \cdot 2 + y(x) \cdot 2}} + \frac{1}{y(x)} - \frac{x}{y(x) \cdot 2} \right) \cdot \text{diff}(y(x), x) = 0$

$$EcuacionOriginal := \frac{x}{\sqrt{x^2 + y(x)^2}} + \frac{1}{x} + \frac{1}{y(x)} + \left(\frac{y(x)}{\sqrt{x^2 + y(x)^2}} + \frac{1}{y(x)} - \frac{x}{y(x)^2} \right) \left(\frac{d}{dx} y(x) \right) = 0 \quad (10)$$

> with(DEtools) :

> odeadvisor(EcuacionOriginal)

[_exact] (11)

$$\begin{aligned} > M := \frac{x}{\text{sqrt}(x \cdot 2 + y \cdot 2)} + \frac{1}{x} + \frac{1}{y} \\ & \quad M := \frac{x}{\sqrt{x^2 + y^2}} + \frac{1}{x} + \frac{1}{y} \end{aligned} \quad (12)$$

$$\begin{aligned} > N := \frac{y}{\text{sqrt}(x \cdot 2 + y \cdot 2)} + \frac{1}{y} - \frac{x}{y \cdot 2} \\ & \quad N := \frac{y}{\sqrt{x^2 + y^2}} + \frac{1}{y} - \frac{x}{y^2} \end{aligned} \quad (13)$$

$$\begin{aligned} > \text{IntMx} := \text{int}(M, x) \\ & \quad \text{IntMx} := \sqrt{x^2 + y^2} + \ln(x) + \frac{x}{y} \end{aligned} \quad (14)$$

$$\begin{aligned} > \text{SolucionGeneral} := \text{IntMx} + \text{int}((N - \text{diff}(\text{IntMx}, y)), y) = C_1 \\ & \quad \text{SolucionGeneral} := \sqrt{x^2 + y^2} + \ln(x) + \frac{x}{y} + \ln(y) = C_1 \end{aligned} \quad (15)$$

$$\begin{aligned} > \text{SolGral} := \sqrt{x^2 + y(x)^2} + \ln(x) + \frac{x}{y(x)} + \ln(y(x)) = C_1 \\ & \quad \text{SolGral} := \sqrt{x^2 + y(x)^2} + \ln(x) + \frac{x}{y(x)} + \ln(y(x)) = C_1 \end{aligned} \quad (16)$$

$$\begin{aligned} > \text{Ecuacion}_1 &:= \text{diff}(\text{SolGral}, x) \\ \text{Ecuacion}_1 &:= \frac{1}{2} \frac{2x + 2y(x) \left(\frac{d}{dx} y(x) \right)}{\sqrt{x^2 + y(x)^2}} + \frac{1}{x} + \frac{1}{y(x)} - \frac{x \left(\frac{d}{dx} y(x) \right)}{y(x)^2} + \frac{\frac{d}{dx} y(x)}{y(x)} = 0 \end{aligned} \quad (17)$$

$$\begin{aligned} > \text{Ecuacion}_2 &:= \text{simplify}(\text{isolate}(\text{Ecuacion}_1, \text{diff}(y(x), x))) \\ \text{Ecuacion}_2 &:= \frac{d}{dx} y(x) = - \frac{y(x) (\sqrt{x^2 + y(x)^2} y(x) + x \sqrt{x^2 + y(x)^2} + y(x) x^2)}{x (y(x)^3 - x \sqrt{x^2 + y(x)^2} + \sqrt{x^2 + y(x)^2} y(x))} \end{aligned} \quad (18)$$

$$\begin{aligned} > \text{Ecuacion}_3 &:= \text{simplify}(\text{isolate}(\text{EcuacionOriginal}, \text{diff}(y(x), x))) \\ \text{Ecuacion}_3 &:= \frac{d}{dx} y(x) = - \frac{y(x) (\sqrt{x^2 + y(x)^2} y(x) + x \sqrt{x^2 + y(x)^2} + y(x) x^2)}{x (y(x)^3 - x \sqrt{x^2 + y(x)^2} + \sqrt{x^2 + y(x)^2} y(x))} \end{aligned} \quad (19)$$

$$\begin{aligned} > \text{Comprobacion}_2 &:= \text{simplify}(\text{rhs}(\text{Ecuacion}_2) - \text{rhs}(\text{Ecuacion}_3)) = 0 \\ & \quad \text{Comprobacion}_2 := 0 = 0 \end{aligned} \quad (20)$$

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