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> restart
> Ecuacion := 2·x + 5·y(x)·3 + 12·x·y(x)·2 - 24·x·2·y(x) + (15·x·y(x)·2 + 12·x·2·y(x)
- 8·x·3 + 2·y(x))·diff(y(x), x) = 0
Ecuacion := 2 x + 5 y(x)3 + 12 x y(x)2 - 24 x2 y(x) + (15 x y(x)2 + 12 x2 y(x) - 8 x3
+ 2 y(x)) (  $\frac{d}{dx}$  y(x) ) = 0
(1)

> with(DEtools) :
> odeadvisor(Ecuacion)
[ _exact, _rational]
(2)

> M := 2·x + 5·y·3 + 12·x·y·2 - 24·x·2·y
M := -24 x2 y + 12 x y2 + 5 y3 + 2 x
(3)

> N := 15 x y2 + 12 x2 y - 8 x3 + 2 y
N := -8 x3 + 12 x2 y + 15 x y2 + 2 y
(4)

> DM y := diff(M, y)
DM y := -24 x2 + 24 x y + 15 y2
(5)

> DN x := diff(N, x)
DN x := -24 x2 + 24 x y + 15 y2
(6)

> POR LO TANTO CONFIRMO QUE LA EDO ES EXACTA
> IntM x := int(M, x)
IntM x := -8 x3 y + 6 x2 y2 + 5 x y3 + x2
(7)

> SolGral := IntM x + int( (N - diff(IntM x, y)), y) = C
SolGral := -8 x3 y + 6 x2 y2 + 5 x y3 + x2 + y2 = C
(8)

> IntN y := int(N, y)
IntN y := -8 x3 y + 6 x2 y2 + 5 x y3 + y2
(9)

> SolGralDos := IntN y + int( (M - diff(IntN y, x)), x) = C
SolGralDos := -8 x3 y + 6 x2 y2 + 5 x y3 + x2 + y2 = C
(10)

> restart
> Ecuacion := x·2 + y(x) - x·diff(y(x), x) = 0
Ecuacion := x2 + y(x) - x (  $\frac{d}{dx}$  y(x) ) = 0
(11)

> M := x2 + y
M := x2 + y
(12)

> N := -x
N := -x
(13)

> DM y := diff(M, y)
DM y := 1
(14)

> DN x := diff(N, x)
DN x := -1
(15)

la ecuación es no exacta
> EcuacionFactorIntegrante :=  $\frac{diff(mu(x), x)}{mu(x)} = \frac{(DM y - DN x)}{N}$ 

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$$EcuacionFactorIntegrante := \frac{\frac{d}{dx} \mu(x)}{\mu(x)} = -\frac{2}{x} \quad (16)$$

$$> FactorIntegrante := \text{int}\left(\frac{1}{\mu}, \mu\right) = \text{int}(\text{rhs}(EcuacionFactorIntegrante), x)$$

$$FactorIntegrante := \ln(\mu) = -2 \ln(x) \quad (17)$$

$$> FactInt := \text{isolate}(FactorIntegrante, \mu)$$

$$FactInt := \mu = \frac{1}{x^2} \quad (18)$$

$$> Ecuacion$$

$$x^2 + y(x) - x \left(\frac{d}{dx} y(x) \right) = 0 \quad (19)$$

$$> EcuacionSegunda := \text{rhs}(FactInt) \cdot Ecuacion$$

$$EcuacionSegunda := \frac{x^2 + y(x) - x \left(\frac{d}{dx} y(x) \right)}{x^2} = 0 \quad (20)$$

$$> MM := \text{expand}\left(\frac{(x^2 + y)}{x \cdot 2}\right)$$

$$MM := 1 + \frac{y}{x^2} \quad (21)$$

$$> NN := -\frac{x}{x \cdot 2}$$

$$NN := -\frac{1}{x} \quad (22)$$

$$> DMM_y := \text{diff}(MM, y)$$

$$DMM_y := \frac{1}{x^2} \quad (23)$$

$$> DNN_x := \text{diff}(NN, x)$$

$$DNN_x := \frac{1}{x^2} \quad (24)$$

Ya es exacta la ecuación

$$> IMM_x := \text{int}(MM, x)$$

$$IMM_x := x - \frac{y}{x} \quad (25)$$

$$> SolGral := IMM_x + \text{int}((NN - \text{diff}(IMM_x, y)), y) = C$$

$$SolGral := x - \frac{y}{x} = C \quad (26)$$

$$> SolGralDos := x - \frac{y(x)}{x} = C$$

$$SolGralDos := x - \frac{y(x)}{x} = C \quad (27)$$

$$> DerivadaDos := \text{simplify}(\text{isolate}(\text{diff}(SolGralDos, x), \text{diff}(y(x), x)))$$

$$\text{DerivadaDos} := \frac{d}{dx} y(x) = \frac{x^2 + y(x)}{x} \quad (28)$$

> *DerivadaTres* := simplify(isolate(Ecuacion, diff(y(x), x)))

$$\text{DerivadaTres} := \frac{d}{dx} y(x) = \frac{x^2 + y(x)}{x} \quad (29)$$

> *SolGralTres* := expand(isolate(SolGralDos, y(x)))

$$\text{SolGralTres} := y(x) = -Cx + x^2 \quad (30)$$

> *Comprobacion* := simplify(eval(subs(y(x) = rhs(SolGralTres), Ecuacion)))

$$\text{Comprobacion} := 0 = 0 \quad (31)$$

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