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> restart
> Ecua := (2·x·y4 - 18·x2·y3 + 32·x3·y2) + (4·x2·y3 - 18·x3·y2 + 16·x4·y)·y'=0
Ecua := 2 x y(x)4 - 18 x2 y(x)3 + 32 x3 y(x)2 + (4 x2 y(x)3 - 18 x3 y(x)2 + 16 x4 y(x)) ( d/dx
y(x) ) = 0 (1)

> with(DEtools):
> odeadvisor(Ecua)
[[_homogeneous, class A], _exact, _rational, _dAlembert] (2)

> M := (2·x·y4 - 18·x2·y3 + 32·x3·y2); N := 4·x2·y3 - 18·x3·y2 + 16·x4·y
M := 32 x3 y2 - 18 x2 y3 + 2 x y4
N := 16 x4 y - 18 x3 y2 + 4 x2 y3 (3)

> Comprobar := diff(M, y) - diff(N, x) = 0
Comprobar := 0 = 0 (4)

La ecuación es EXACTA

> IntMx := expand(int(M, x))
IntMx := 8 y2 x4 - 6 y3 x3 + y4 x2 (5)

> SolGral := IntMx + int((N - diff(IntMx, y)), y) = _C1
SolGral := 8 y2 x4 - 6 y3 x3 + y4 x2 = _C1 (6)

> IntNy := expand(int(N, y))
IntNy := 8 y2 x4 - 6 y3 x3 + y4 x2 (7)

> SolGralDos := IntNy + int((M - diff(IntNy, x)), x) = _C1
SolGralDos := 8 y2 x4 - 6 y3 x3 + y4 x2 = _C1 (8)

> MM := factor(M)
MM := 2 x y2 (16 x2 - 9 x y + y2) (9)

> NN := factor(N)
NN := 2 y x2 (8 x2 - 9 x y + 2 y2) (10)

> MM := x·(32·x2·y2 - 18·x·y3 + 2·y4)
MM := x (32 x2 y2 - 18 x y3 + 2 y4) (11)

> NN := x·(16·x3·y - 18·x2·y2 + 4·x·y3)
NN := x (16 x3 y - 18 x2 y2 + 4 x y3) (12)

> EcuaDos := MM + NN·y'=0
EcuaDos := x (32 x2 y2 - 18 x y3 + 2 y4) + x (16 x3 y - 18 x2 y2 + 4 x y3) ( d/dx y(x) ) = 0 (13)

> EcuaTres := (2 y(x)4 + 32 x2 y(x)2 - 18 x y(x)3) + (16 x3 y(x) - 18 x2 y(x)2 + 4 x y(x)3)
·diff(y(x), x) = 0
EcuaTres := 2 y(x)4 + 32 x2 y(x)2 - 18 x y(x)3 + (16 x3 y(x) - 18 x2 y(x)2 + 4 x y(x)3) ( d/dx (14)

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$$y(x) \Big) = 0$$

$$\begin{aligned} &> \text{with}(DEtools) : \\ &> \text{odeadvisor}(EcuaTres) \\ &\quad [[_homogeneous, class A], _rational, _dAlembert] \end{aligned} \quad (15)$$

$$\begin{aligned} &> \text{intfactor}(EcuaTres) \\ &\quad x \end{aligned} \quad (16)$$

$$\begin{aligned} &> MMM := 2 y^4 + 32 x^2 y^2 - 18 x y^3 \\ &\quad MMM := 32 x^2 y^2 - 18 x y^3 + 2 y^4 \end{aligned} \quad (17)$$

$$\begin{aligned} &> NNN := (16 x^3 y - 18 x^2 y^2 + 4 x y^3) \\ &\quad NNN := 16 x^3 y - 18 x^2 y^2 + 4 x y^3 \end{aligned} \quad (18)$$

$$\begin{aligned} &> DPMMM_y := \text{diff}(MMM, y) \\ &\quad DPMMM_y := 64 x^2 y - 54 x y^2 + 8 y^3 \end{aligned} \quad (19)$$

$$\begin{aligned} &> DPNNN_x := \text{diff}(NNN, x) \\ &\quad DPNNN_x := 48 x^2 y - 36 x y^2 + 4 y^3 \end{aligned} \quad (20)$$

$$\begin{aligned} &> EcuaFactInt := \text{isolate}\left(\text{int}\left(\frac{1}{FI}, FI\right) = \text{int}\left(\frac{(DPMMM_y - DPNNN_x)}{NNN}, x\right), FI\right) \\ &\quad EcuaFactInt := FI = x \end{aligned} \quad (21)$$

> restart

$$\begin{aligned} &> Ecua := (x + y^2) - 2 \cdot x \cdot y \cdot y' = 0 \\ &\quad Ecua := x + y(x)^2 - 2 x y(x) \left( \frac{d}{dx} y(x) \right) = 0 \end{aligned} \quad (22)$$

$$\begin{aligned} &> M := (x + y^2); N := -2 \cdot x \cdot y \\ &\quad M := y^2 + x \\ &\quad N := -2 x y \end{aligned} \quad (23)$$

$$\begin{aligned} &> \text{with}(DEtools) : \\ &> \text{odeadvisor}(Ecua) \\ &\quad [[_homogeneous, class G], _rational, _Bernoulli] \end{aligned} \quad (24)$$

$$\begin{aligned} &> FI := \text{intfactor}(Ecua) \\ &\quad FI := \frac{1}{x^2} \end{aligned} \quad (25)$$

$$\begin{aligned} &> EcuaDos := FI \cdot M + FI \cdot N \cdot y' = 0 \\ &\quad EcuaDos := \frac{y^2 + x}{x^2} - \frac{2 y \left( \frac{d}{dx} y(x) \right)}{x} = 0 \end{aligned} \quad (26)$$

$$\begin{aligned} &> MM := \frac{y^2 + x}{x^2}; NN := -\frac{2 y}{x} \\ &\quad MM := \frac{y^2 + x}{x^2} \end{aligned}$$

$$NN := -\frac{2y}{x} \quad (27)$$

> diff(MM, y)

$$\frac{2y}{x^2} \quad (28)$$

> diff(NN, x)

$$\frac{2y}{x^2} \quad (29)$$

> IntMMx := int(MM, x)

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

> SG := IntMMx + int((NN - diff(IntMMx, y)), y) = \_CI

$$SG := \ln(x) - \frac{y^2}{x} = \_CI \quad (31)$$

> CondIni := y(1) = 3

$$CondIni := y(1) = 3 \quad (32)$$

> Para := subs(x=1, y=3, SG)

$$Para := \ln(1) - 9 = \_CI \quad (33)$$

> SP := subs(\_CI = lhs(Para), SG)

$$SP := \ln(x) - \frac{y^2}{x} = -9 \quad (34)$$

Para comprobar

> SSPP := dsolve({Ecua, CondIni})

$$SSPP := y(x) = \sqrt{(\ln(x) + 9)x} \quad (35)$$

> SPdos := ln(x) -  $\frac{y(x)^2}{x}$  = -9

$$SPdos := \ln(x) - \frac{y(x)^2}{x} = -9 \quad (36)$$

> DerSP := simplify(isolate(diff(SPdos, x), diff(y(x), x)))

$$DerSP := \frac{d}{dx} y(x) = \frac{x + y(x)^2}{2xy(x)} \quad (37)$$

> DerEcua := simplify(isolate(Ecua, diff(y(x), x)))

$$DerEcua := \frac{d}{dx} y(x) = \frac{x + y(x)^2}{2xy(x)} \quad (38)$$

> ComprobarCondIni := simplify(subs(x=1, y(1)=3, SPdos))

$$ComprobarCondIni := -9 = -9 \quad (39)$$

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