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> restart
> Ecua := y' =  $\frac{1}{(x \cdot \sin(y) + 2 \cdot \sin(2 y))}$ 
      Ecua :=  $\frac{d}{dx} y(x) = \frac{1}{x \sin(y(x)) + 2 \sin(2 y(x))}$  (1)
> EcuaDos := -1 + (x sin(y(x)) + 2 sin(2 y(x))) · diff(y(x), x) = 0
      EcuaDos := -1 + (x sin(y(x)) + 2 sin(2 y(x)))  $\left( \frac{d}{dx} y(x) \right) = 0$  (2)
> M := -1; N := x sin(y) + 2 sin(2 y)
      M := -1
      N := x sin(y) + 2 sin(2 y) (3)
> diff(M, y) = diff(N, x)
      0 = sin(y) (4)
> EcuaTres := diff(x(y), y) = x(y) · sin(y) + 2 · sin(2 y)
      EcuaTres :=  $\frac{d}{dy} x(y) = x(y) \sin(y) + 2 \sin(2 y)$  (5)
> EcuaCuatro := diff(x(y), y) - sin(y) · x(y) = 2 · sin(2 y)
      EcuaCuatro :=  $\frac{d}{dy} x(y) - x(y) \sin(y) = 2 \sin(2 y)$  (6)
> P := -sin(y); Q := 2 · sin(2 y)
      P := -sin(y)
      Q := 2 sin(2 y) (7)
> IntPy := int(P, y)
      IntPy := cos(y) (8)
> IntPmenos := int(-P, y)
      IntPmenos := -cos(y) (9)
> SolGral := x(y) = simplify(_C1 · exp(IntPmenos) + exp(IntPmenos) · int(exp(IntPy) · Q, y))
      SolGral := x(y) = -4 cos(y) + 4 + _C1 e-cos(y) (10)
> SolGralHom := x(y) = _C1 e-cos(y)
      SolGralHom := x(y) = _C1 e-cos(y) (11)
> EcuaHom := lhs(EcuaCuatro) = 0
      EcuaHom :=  $\frac{d}{dy} x(y) - x(y) \sin(y) = 0$  (12)
> Comprobar := eval(subs(x(y) = rhs(SolGralHom), EcuaHom))
      Comprobar := 0 = 0 (13)
> ComprobarNoHom := expand(eval(subs(x(y) = rhs(SolGral), EcuaCuatro)))
      ComprobarNoHom := 4 sin(y) cos(y) = 4 sin(y) cos(y) (14)
> restart
> Ecua := x · (2 x2 + y2) + y · (x2 + 2 · y2) · y' = 0 (15)

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$$Ecua := x (2 x^2 + y(x)^2) + y(x) (x^2 + 2 y(x)^2) \left(\frac{d}{dx} y(x) \right) = 0 \quad (15)$$

$$\begin{aligned} &> M := \text{expand}(x \cdot (2 x^2 + y^2)) \\ &M := 2 x^3 + x y^2 \end{aligned} \quad (16)$$

$$\begin{aligned} &> N := \text{expand}(y \cdot (x^2 + 2 \cdot y^2)) \\ &N := x^2 y + 2 y^3 \end{aligned} \quad (17)$$

$$\begin{aligned} &> Exacta := \text{diff}(M, y) - \text{diff}(N, x) = 0 \\ &Exacta := 0 = 0 \end{aligned} \quad (18)$$

$$\begin{aligned} &> IntMx := \text{int}(x \cdot y^2, x) \\ &IntMx := \frac{x^2 y^2}{2} \end{aligned} \quad (19)$$

$$\begin{aligned} &> IntMxx := \text{int}(2 \cdot x^3, x) \\ &IntMxx := \frac{x^4}{2} \end{aligned} \quad (20)$$

$$\begin{aligned} &> IntMxxx := IntMx + IntMxx \\ &IntMxxx := \frac{1}{2} x^2 y^2 + \frac{1}{2} x^4 \end{aligned} \quad (21)$$

$$\begin{aligned} &> N - IntMxx \\ &x^2 y + 2 y^3 - \frac{1}{2} x^4 \end{aligned} \quad (22)$$

$$\begin{aligned} &> SolGral := \text{simplify}(IntMxxx + \text{int}(N - \text{diff}(IntMxxx, y), y)) = _CI \\ &SolGral := \frac{1}{2} x^2 y^2 + \frac{1}{2} x^4 + \frac{1}{2} y^4 = _CI \end{aligned} \quad (23)$$

$$\begin{aligned} &> Ecua \\ &x (2 x^2 + y(x)^2) + y(x) (x^2 + 2 y(x)^2) \left(\frac{d}{dx} y(x) \right) = 0 \end{aligned} \quad (24)$$

$$\begin{aligned} &> SolGralFinal := x^2 y(x)^2 + x^4 + y(x)^4 = _CI \\ &SolGralFinal := x^2 y(x)^2 + x^4 + y(x)^4 = _CI \end{aligned} \quad (25)$$

$$\begin{aligned} &> DerSolFinal := \text{isolate}(\text{diff}(SolGralFinal, x), \text{diff}(y(x), x)) \\ &DerSolFinal := \frac{d}{dx} y(x) = \frac{-2 x y(x)^2 - 4 x^3}{2 x^2 y(x) + 4 y(x)^3} \end{aligned} \quad (26)$$

$$\begin{aligned} &> DerEcua := \text{isolate}(Ecua, \text{diff}(y(x), x)) \\ &DerEcua := \frac{d}{dx} y(x) = -\frac{x (2 x^2 + y(x)^2)}{y(x) (x^2 + 2 y(x)^2)} \end{aligned} \quad (27)$$

$$\begin{aligned} &> Comprobar := \text{simplify}(\text{rhs}(DerEcua) - \text{rhs}(DerSolFinal)) = 0 \\ &Comprobar := 0 = 0 \end{aligned} \quad (28)$$

> restart

$$> Ecua := (x + y^2) + (-2 \cdot x \cdot y) \cdot y' = 0$$

(29)

$$Ecua := x + y(x)^2 - 2 x y(x) \left(\frac{d}{dx} y(x) \right) = 0 \quad (29)$$

$$> M := (x + y^2)$$

$$M := y^2 + x \quad (30)$$

$$> N := -2 x y$$

$$N := -2 x y \quad (31)$$

$$> ExactaNo := \text{diff}(M, y) - \text{diff}(N, x) \neq 0$$

$$ExactaNo := 4 y \neq 0 \quad (32)$$

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

$$> IntFact := \text{intfactor}(Ecua)$$

$$IntFact := \frac{1}{x^2} \quad (33)$$

$$> MM := \text{expand}(IntFact \cdot M)$$

$$MM := \frac{y^2}{x^2} + \frac{1}{x} \quad (34)$$

$$> NN := IntFact \cdot N$$

$$NN := -\frac{2 y}{x} \quad (35)$$

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

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

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

$$SolGral := \ln(x) - \frac{y^2}{x} = _CI \quad (37)$$

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

$$SolGralFinal := \ln(x) - \frac{y(x)^2}{x} = _CI \quad (38)$$

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

$$DerSolFinal := \frac{d}{dx} y(x) = \frac{x + y(x)^2}{2 x y(x)} \quad (39)$$

$$> Ecua$$

$$x + y(x)^2 - 2 x y(x) \left(\frac{d}{dx} y(x) \right) = 0 \quad (40)$$

$$> DerEcua := \text{isolate}(Ecua, \text{diff}(y(x), x))$$

$$DerEcua := \frac{d}{dx} y(x) = -\frac{-x - y(x)^2}{2 x y(x)} \quad (41)$$

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