

FACULTAD DE INGENIERIA
DIVISION DE CIENCIAS BASICAS
ECUACIONES DIFERENCIALES
GRUPO 10 SEMESTRE 2025-2
SERIE 1

> restart

1) Sea la ecuación diferencial

> Ecuacion := y' = (x - 4·y - 1)²

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

> CondIni := y(0) = 0

$$CondIni := y(0) = 0 \quad (2)$$

>

SOLUCIÓN

> Sug := z(x) = x - 4y(x) - 1

$$Sug := z(x) = x - 4y(x) - 1 \quad (3)$$

> Sub := isolate(Sug, y(x))

$$Sub := y(x) = -\frac{z(x)}{4} + \frac{x}{4} - \frac{1}{4} \quad (4)$$

> EcuaDos := isolate(eval(subs(y(x) = rhs(Sub), Ecuacion)), diff(z(x), x))

$$EcuaDos := \frac{d}{dx} z(x) = -4z(x)^2 + 1 \quad (5)$$

> EcuaTres := -rhs(EcuaDos) + lhs(EcuaDos) = 0

$$EcuaTres := 4z(x)^2 - 1 + \frac{d}{dx} z(x) = 0 \quad (6)$$

> M := 4z² - 1; N := 1

$$\begin{aligned} M &:= 4z^2 - 1 \\ N &:= 1 \end{aligned} \quad (7)$$

VARIABLES SEPARABLES

> P := 4; Q := z² - 1/4; R := 1; S := 1

$$P := 4$$

$$Q := z^2 - \frac{1}{4}$$

$$R := 1$$

$$S := 1$$

(8)

> SolIntermedia := int(P/R, x) + int(S/Q, z) = _CI

$$SolIntermedia := 4x - \ln(2z + 1) + \ln(2z - 1) = _CI \quad (9)$$

> SolInter := 4x - ln(2z(x) + 1) + ln(2z(x) - 1) = _CI

$$SolInter := 4x - \ln(2z(x) + 1) + \ln(2z(x) - 1) = _CI \quad (10)$$

> Sug

$$z(x) = x - 4y(x) - 1 \quad (11)$$

> SolGralFinal := expand(subs(Sug, SolInter))

$$SolGralFinal := 4x - \ln(2x - 8y(x) - 1) + \ln(2x - 8y(x) - 3) = _CI \quad (12)$$

> DerSolGral := simplify(isolate(diff(SolGralFinal, x), diff(y(x), x)))

$$DerSolGral := \frac{d}{dx} y(x) = (x - 4y(x) - 1)^2 \quad (13)$$

> Ecuacion

$$\frac{d}{dx} y(x) = (x - 4y(x) - 1)^2 \quad (14)$$

> Comprobar := rhs(DerSolGral) - rhs(Ecuacion) = 0

$$Comprobar := 0 = 0 \quad (15)$$

> CondIni

$$y(0) = 0 \quad (16)$$

> Para := subs(x=0, y(0)=0, SolGralFinal)

$$Para := -\ln(-1) + \ln(-3) = _CI \quad (17)$$

> SolPart := subs(_CI = lhs(Para), SolGralFinal)

$$SolPart := 4x - \ln(2x - 8y(x) - 1) + \ln(2x - 8y(x) - 3) = \ln(3) \quad (18)$$

> DerSolPart := simplify(isolate(diff(SolPart, x), diff(y(x), x)))

$$DerSolPart := \frac{d}{dx} y(x) = (x - 4y(x) - 1)^2 \quad (19)$$

> Ecuacion

$$\frac{d}{dx} y(x) = (x - 4y(x) - 1)^2 \quad (20)$$

> restart

2) Resuelva

> Ecuacion := y' = $\frac{\sin(y)}{(x \cdot \cos(y) - \sin(y)^2)}$

$$Ecuacion := \frac{d}{dx} y(x) = \frac{\sin(y(x))}{x \cos(y(x)) - \sin(y(x))^2} \quad (21)$$

> CondIni := y(0) = $\frac{\pi}{2}$

$$CondIni := y(0) = \frac{\pi}{2} \quad (22)$$

> Ecua := -(sin(y(x))) + (x cos(y(x)) - sin(y(x))^2) · diff(y(x), x) = 0

$$Ecua := -\sin(y(x)) + (x \cos(y(x)) - \sin(y(x))^2) \left(\frac{d}{dx} y(x) \right) = 0 \quad (23)$$

SOLUCIÓN

> with(DEtools):

$$\begin{aligned} &> \text{intfactor}(Ecu) \\ & \frac{1}{\sin(y(x))^2} \end{aligned} \quad (24)$$

$$\begin{aligned} &> \text{IntFact} := \frac{1}{\sin(y)^2} \\ & \text{IntFact} := \frac{1}{\sin(y)^2} \end{aligned} \quad (25)$$

$$\begin{aligned} &> M := -\sin(y); N := (x \cos(y) - \sin(y)^2) \\ & \quad M := -\sin(y) \\ & \quad N := x \cos(y) - \sin(y)^2 \end{aligned} \quad (26)$$

$$\begin{aligned} &> MM := \text{simplify}(\text{IntFact} \cdot M); NN := \text{simplify}(\text{IntFact} \cdot N) \\ & \quad MM := -\csc(y) \\ & \quad NN := x \cot(y) \csc(y) - 1 \end{aligned} \quad (27)$$

$$\begin{aligned} &> \text{comprobar} := \text{diff}(MM, y) - \text{diff}(NN, x) = 0 \\ & \quad \text{comprobar} := 0 = 0 \end{aligned} \quad (28)$$

$$\begin{aligned} &> \text{IntMMx} := \text{int}(MM, x) \\ & \quad \text{IntMMx} := -\csc(y) x \end{aligned} \quad (29)$$

$$\begin{aligned} &> \text{SolGral} := \text{IntMMx} + \text{int}((NN - \text{diff}(\text{IntMMx}, y)), y) = _CI \\ & \quad \text{SolGral} := -\csc(y) x - y = _CI \end{aligned} \quad (30)$$

$$\begin{aligned} &> \text{SolGralFinal} := -\csc(y(x)) x - y(x) = _CI \\ & \quad \text{SolGralFinal} := -\csc(y(x)) x - y(x) = _CI \end{aligned} \quad (31)$$

$$\begin{aligned} &> \text{DerSolFinal} := \text{isolate}(\text{diff}(\text{SolGralFinal}, x), \text{diff}(y(x), x)) \\ & \quad \text{DerSolFinal} := \frac{d}{dx} y(x) = \frac{\csc(y(x))}{\csc(y(x)) \cot(y(x)) x - 1} \end{aligned} \quad (32)$$

$$\begin{aligned} &> \text{Ecuacion} \\ & \quad \frac{d}{dx} y(x) = \frac{\sin(y(x))}{x \cos(y(x)) - \sin(y(x))^2} \end{aligned} \quad (33)$$

$$\begin{aligned} &> \text{Comprobar} := \text{simplify}(\text{rhs}(\text{DerSolFinal}) - \text{rhs}(\text{Ecuacion})) = 0 \\ & \quad \text{Comprobar} := 0 = 0 \end{aligned} \quad (34)$$

$$\begin{aligned} &> \text{Para} := \text{subs}\left(x=0, y=\frac{\text{Pi}}{2}, \text{SolGral}\right) \\ & \quad \text{Para} := -\frac{\pi}{2} = _CI \end{aligned} \quad (35)$$

$$\begin{aligned} &> \text{SolPartFinal} := \text{subs}(_CI = \text{lhs}(\text{Para}), \text{SolGralFinal}) \\ & \quad \text{SolPartFinal} := -\csc(y(x)) x - y(x) = -\frac{\pi}{2} \end{aligned} \quad (36)$$

$$\begin{aligned} &> \text{ComprobarDos} := \text{subs}(x=0, \text{SolPartFinal}) \\ & \quad \text{ComprobarDos} := -y(0) = -\frac{\pi}{2} \end{aligned} \quad (37)$$

$$\begin{aligned} &> \text{DerSolPart} := \text{isolate}(\text{diff}(\text{SolPartFinal}, x), \text{diff}(y(x), x)) \\ &\quad \text{DerSolPart} := \frac{d}{dx} y(x) = \frac{\csc(y(x))}{\csc(y(x)) \cot(y(x)) x - 1} \end{aligned} \quad (38)$$

$$\begin{aligned} &> \text{ComprobarTres} := \text{simplify}(\text{rhs}(\text{DerSolPart}) - \text{rhs}(\text{Ecuacion})) = 0 \\ &\quad \text{ComprobarTres} := 0 = 0 \end{aligned} \quad (39)$$

restart

3)

$$\begin{aligned} &> \text{Ecua} := y' + \frac{y}{x} = \log(x) \\ &\quad \text{Ecua} := \frac{d}{dx} y(x) + \frac{y(x)}{x} = \ln(x) \end{aligned} \quad (40)$$

SOLUCIÓN

$$\begin{aligned} &> P := \frac{1}{x}; Q := \log(x) \\ &\quad P := \frac{1}{x} \\ &\quad Q := \ln(x) \end{aligned} \quad (41)$$

$$\begin{aligned} &> \text{ExpIntP} := \exp(\text{int}(P, x)) \\ &\quad \text{ExpIntP} := x \end{aligned} \quad (42)$$

$$\begin{aligned} &> \text{ExpIntPNeg} := \exp(-\text{int}(P, x)) \\ &\quad \text{ExpIntPNeg} := \frac{1}{x} \end{aligned} \quad (43)$$

$$\begin{aligned} &> \text{SolGral} := y(x) = _C1 \cdot \text{ExpIntPNeg} + \text{simplify}(\text{ExpIntPNeg} \cdot \text{int}(\text{ExpIntP} \cdot Q, x)) \\ &\quad \text{SolGral} := y(x) = \frac{C1}{x} + \frac{x \ln(x)}{2} - \frac{x}{4} \end{aligned} \quad (44)$$

$$\begin{aligned} &> \text{Ecua} \\ &\quad \frac{d}{dx} y(x) + \frac{y(x)}{x} = \ln(x) \end{aligned} \quad (45)$$

$$\begin{aligned} &> \text{Comprobar} := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{SolGral}), \text{lhs}(\text{Ecua}) - \text{rhs}(\text{Ecua}) = 0))) \\ &\quad \text{Comprobar} := 0 = 0 \end{aligned} \quad (46)$$

restart

4)

$$\begin{aligned} &> \text{Ecua} := \exp(x) \cdot (y - 1) + 2 \cdot (\exp(x) + 4) \cdot y' = 0 \\ &\quad \text{Ecua} := e^x (y(x) - 1) + 2 (e^x + 4) \left(\frac{d}{dx} y(x) \right) = 0 \end{aligned} \quad (47)$$

$$\begin{aligned} &> \text{CondIni} := y(0) = 2 \\ &\quad \text{CondIni} := y(0) = 2 \end{aligned} \quad (48)$$

SOLUCION

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

$$\begin{aligned} &> \text{odeadvisor}(Ecua) \\ &\quad \quad \quad [_{separable}] \end{aligned} \tag{49}$$

$$\begin{aligned} &> M := e^x (y - 1); N := 2 (e^x + 4) \\ &\quad \quad \quad M := e^x (y - 1) \\ &\quad \quad \quad N := 2 e^x + 8 \end{aligned} \tag{50}$$

$$\begin{aligned} &> P := \exp(x); Q := y - 1; R := \exp(x) + 4; S := 2 \\ &\quad \quad \quad P := e^x \\ &\quad \quad \quad Q := y - 1 \\ &\quad \quad \quad R := e^x + 4 \\ &\quad \quad \quad S := 2 \end{aligned} \tag{51}$$

$$\begin{aligned} &> SolGral := \int \left(\frac{P}{R}, x \right) + \int \left(\frac{S}{Q}, y \right) = _C1 \\ &\quad \quad \quad SolGral := \ln(e^x + 4) + 2 \ln(y - 1) = _C1 \end{aligned} \tag{52}$$

$$\begin{aligned} &> SolGralDos := \text{simplify}(\exp(\text{lhs}(SolGral))) = _C1 \\ &\quad \quad \quad SolGralDos := (e^x + 4) (y - 1)^2 = _C1 \end{aligned} \tag{53}$$

$$\begin{aligned} &> SolGralFinal := (e^x + 4) (y(x) - 1)^2 = _C1 \\ &\quad \quad \quad SolGralFinal := (e^x + 4) (y(x) - 1)^2 = _C1 \end{aligned} \tag{54}$$

$$\begin{aligned} &> DerSolFinal := \text{isolate}(\text{diff}(SolGralFinal, x), \text{diff}(y(x), x)) \\ &\quad \quad \quad DerSolFinal := \frac{d}{dx} y(x) = - \frac{e^x (y(x) - 1)}{2 (e^x + 4)} \end{aligned} \tag{55}$$

$$\begin{aligned} &> Ecua \\ &\quad \quad \quad e^x (y(x) - 1) + 2 (e^x + 4) \left(\frac{d}{dx} y(x) \right) = 0 \end{aligned} \tag{56}$$

$$\begin{aligned} &> DerEcua := \text{isolate}(Ecua, \text{diff}(y(x), x)) \\ &\quad \quad \quad DerEcua := \frac{d}{dx} y(x) = - \frac{e^x (y(x) - 1)}{2 e^x + 8} \end{aligned} \tag{57}$$

$$\begin{aligned} &> Comprobar := \text{simplify}(\text{rhs}(DerSolFinal) - \text{rhs}(DerEcua)) = 0 \\ &\quad \quad \quad Comprobar := 0 = 0 \end{aligned} \tag{58}$$

$$\begin{aligned} &> Para := \text{simplify}(\text{subs}(x=0, y=2, SolGralDos)) \\ &\quad \quad \quad Para := 5 = _C1 \end{aligned} \tag{59}$$

$$\begin{aligned} &> SolPartFinal := \text{subs}(_C1 = \text{lhs}(Para), SolGralFinal) \\ &\quad \quad \quad SolPartFinal := (e^x + 4) (y(x) - 1)^2 = 5 \end{aligned} \tag{60}$$

$$\begin{aligned} &> DerSolPart := \text{isolate}(\text{diff}(SolPartFinal, x), \text{diff}(y(x), x)) \\ &\quad \quad \quad DerSolPart := \frac{d}{dx} y(x) = - \frac{e^x (y(x) - 1)}{2 (e^x + 4)} \end{aligned} \tag{61}$$

$$\begin{aligned} &> ComprobarDos := \text{simplify}(\text{rhs}(DerSolPart) - \text{rhs}(DerEcua)) = 0 \\ &\quad \quad \quad ComprobarDos := 0 = 0 \end{aligned} \tag{62}$$

restart

5)

> $Ecua := -x \cdot y' - x = -y$

$$Ecua := -x \left(\frac{d}{dx} y(x) \right) - x = -y(x) \quad (63)$$

> $CondIni := y(1) = -1$

$$CondIni := y(1) = -1 \quad (64)$$

>

SOLUCION

> $EcuaDos := lhs(Ecua) + x + y(x) = rhs(Ecua) + x + y(x)$

$$EcuaDos := -x \left(\frac{d}{dx} y(x) \right) + y(x) = x \quad (65)$$

> $EcuaTres := expand\left(\frac{lhs(EcuaDos)}{-x}\right) = \frac{rhs(EcuaDos)}{-x}$

$$EcuaTres := \frac{d}{dx} y(x) - \frac{y(x)}{x} = -1 \quad (66)$$

> $p := -\frac{1}{x}$

$$p := -\frac{1}{x} \quad (67)$$

> $q := -1$

$$q := -1 \quad (68)$$

> $SolGral := y(x) = _C1 \cdot \exp(-\text{int}(p, x)) + \exp(-\text{int}(p, x)) \cdot \text{int}(\exp(\text{int}(p, x)) \cdot q, x)$

$$SolGral := y(x) = _C1 x - x \ln(x) \quad (69)$$

> $ComprobarUno := simplify(eval(subs(y(x) = rhs(SolGral), lhs(Ecua) - rhs(Ecua) = 0)))$

$$ComprobarUno := 0 = 0 \quad (70)$$

> $CondIni$

$$y(1) = -1 \quad (71)$$

> $Para := simplify(isolate(-1 = subs(x = 1, rhs(SolGral)), _C1))$

$$Para := _C1 = -1 \quad (72)$$

> $SolPart := subs(_C1 = rhs(Para), SolGral)$

$$SolPart := y(x) = -x - x \ln(x) \quad (73)$$

> $ComprobarDos := simplify(eval(subs(y(x) = rhs(SolPart), lhs(Ecua) - rhs(Ecua) = 0)))$

$$ComprobarDos := 0 = 0 \quad (74)$$

> $restart$

7)

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

$$Ecua := (2 x^2 y(x) - x) \left(\frac{d}{dx} y(x) \right) = -y(x) \quad (75)$$

> $with(DEtools):$

> $odeadvisor(Ecua)$

$$[[_homogeneous, class G], _rational, [_Abel, 2nd type, class B]] \quad (76)$$

> *FactInt* := *intfactor*(*Ecua*)

$$FactInt := \frac{1}{x^2} \quad (77)$$

> *EcuaDos* := *simplify*(*FactInt*·*lhs*(*Ecua*)) − *FactInt*·*rhs*(*Ecua*) = 0

$$EcuaDos := \frac{(2xy(x) - 1) \left(\frac{d}{dx} y(x) \right)}{x} + \frac{y(x)}{x^2} = 0 \quad (78)$$

> *odeadvisor*(*EcuaDos*)

[[_homogeneous, class G], _exact, _rational, [_Abel, 2nd type, class B]] (79)

> *M* := $\frac{y}{x^2}$

$$M := \frac{y}{x^2} \quad (80)$$

> *N* := *expand* $\left(\frac{(2y \cdot x - 1)}{x}\right)$

$$N := 2y - \frac{1}{x} \quad (81)$$

> *diff*(*M*, *y*) = *diff*(*N*, *x*)

$$\frac{1}{x^2} = \frac{1}{x^2} \quad (82)$$

> *IntMx* := *int*(*M*, *x*)

$$IntMx := -\frac{y}{x} \quad (83)$$

> *SolGral* := *IntMx* + *int*((*N* − *diff*(*IntMx*, *y*)), *y*) = _C1

$$SolGral := -\frac{y}{x} + y^2 = _C1 \quad (84)$$

> *SolFinal* := $-\frac{y(x)}{x} + y(x)^2 = _C1$

$$SolFinal := -\frac{y(x)}{x} + y(x)^2 = _C1 \quad (85)$$

> *DerSolFinal* := *isolate*(*diff*(*SolFinal*, *x*), *diff*(*y*(*x*), *x*))

$$DerSolFinal := \frac{d}{dx} y(x) = -\frac{y(x)}{x^2 \left(-\frac{1}{x} + 2y(x) \right)} \quad (86)$$

> *Ecua*

$$(2x^2y(x) - x) \left(\frac{d}{dx} y(x) \right) = -y(x) \quad (87)$$

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

$$DerEcua := \frac{d}{dx} y(x) = -\frac{y(x)}{2x^2y(x) - x} \quad (88)$$

$$\begin{aligned} &> \text{Comprobar} := \text{simplify}(\text{rhs}(\text{DerSolFinal}) - \text{rhs}(\text{DerEcua})) = 0 \\ &\text{Comprobar} := 0 = 0 \end{aligned} \quad (89)$$

restart

8)

$$\begin{aligned} &> \text{Ecua} := (x + 3)^2 \cdot y' = 4 - 9 \cdot y - 3 \cdot x \cdot y \\ &\text{Ecua} := (x + 3)^2 \left(\frac{d}{dx} y(x) \right) = 4 - 9 y(x) - 3 x y(x) \end{aligned} \quad (90)$$

SOLUCIÓN

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

$$\begin{aligned} &> \text{odeadvisor}(\text{Ecua}) \\ &[_{\text{linear}}] \end{aligned} \quad (91)$$

$$\begin{aligned} &> \text{IntFact} := \text{intfactor}(\text{Ecua}) \\ &\text{IntFact} := x + 3 \end{aligned} \quad (92)$$

$$\begin{aligned} &> M := -(4 - 9 y - 3 x y) \\ &M := 3 x y + 9 y - 4 \end{aligned} \quad (93)$$

$$\begin{aligned} &> N := (x + 3)^2 \\ &N := (x + 3)^2 \end{aligned} \quad (94)$$

$$\begin{aligned} &> MM := \text{IntFact} \cdot M \\ &MM := (x + 3) (3 x y + 9 y - 4) \end{aligned} \quad (95)$$

$$\begin{aligned} &> NN := \text{IntFact} \cdot N \\ &NN := (x + 3)^3 \end{aligned} \quad (96)$$

$$\begin{aligned} &> \text{expand}(\text{diff}(MM, y)) \\ &3 x^2 + 18 x + 27 \end{aligned} \quad (97)$$

$$\begin{aligned} &> \text{expand}(\text{diff}(NN, x)) \\ &3 x^2 + 18 x + 27 \end{aligned} \quad (98)$$

$$\begin{aligned} &> \text{IntMMx} := \text{expand}(\text{int}(MM, x)) \\ &\text{IntMMx} := y x^3 + 9 y x^2 - 2 x^2 + 27 x y - 12 x \end{aligned} \quad (99)$$

$$\begin{aligned} &> \text{SolGral} := \text{simplify}(\text{IntMMx} + \text{int}((NN - \text{diff}(\text{IntMMx}, y)), y)) = _CI \\ &\text{SolGral} := y x^3 + (9 y - 2) x^2 + (27 y - 12) x + 27 y = _CI \end{aligned} \quad (100)$$

$$\begin{aligned} &> \text{SolFinal} := \text{isolate}(y(x) x^3 + (9 y(x) - 2) x^2 + (27 y(x) - 12) x + 27 y(x) = _CI, y(x)) \\ &\text{SolFinal} := y(x) = \frac{2 x^2 + _CI + 12 x}{x^3 + 9 x^2 + 27 x + 27} \end{aligned} \quad (101)$$

$$\begin{aligned} &> \text{Ecua} \\ &(x + 3)^2 \left(\frac{d}{dx} y(x) \right) = 4 - 9 y(x) - 3 x y(x) \end{aligned} \quad (102)$$

$$\begin{aligned} &> \text{Comprobar} := \text{simplify}(\text{eval}(\text{subs}(y(x) = \text{rhs}(\text{SolFinal}), \text{lhs}(\text{Ecua}) - \text{rhs}(\text{Ecua}) = 0))) \\ &\text{Comprobar} := 0 = 0 \end{aligned} \quad (103)$$

restart

9)

$$> \text{Ecua} := x \cdot y^2 \cdot y' - y^3 - 1 = 0$$

$$\text{Ecua} := x y(x)^2 \left(\frac{d}{dx} y(x) \right) - y(x)^3 - 1 = 0 \quad (104)$$

> with(DEtools) :

> odeadvisor(Ecua)

[_separable] (105)

$$> M := -y^3 - 1$$

$$M := -y^3 - 1 \quad (106)$$

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

$$N := x y^2 \quad (107)$$

$$> P := -1; Q := y^3 + 1; R := x; S := y^2$$

$$P := -1$$

$$Q := y^3 + 1$$

$$R := x$$

$$S := y^2$$

(108)

$$> \text{SolGral} := \int \left(\frac{P}{R}, x \right) + \int \left(\frac{S}{Q}, y \right) = _CI$$

$$\text{SolGral} := -\ln(x) + \frac{\ln(y^3 + 1)}{3} = _CI \quad (109)$$

$$> \text{SolFinal} := \text{simplify}(\exp(\text{lhs}(\text{SolGral}))) = _CI$$

$$\text{SolFinal} := \frac{(y^3 + 1)^{1/3}}{x} = _CI \quad (110)$$

$$> \text{SolFinalDos} := \text{lhs}(\text{SolFinal}) \cdot x = \text{rhs}(\text{SolFinal}) \cdot x$$

$$\text{SolFinalDos} := (y^3 + 1)^{1/3} = _CI x \quad (111)$$

$$> \text{SolFinalTres} := \text{lhs}(\text{SolFinalDos})^3 = _CI \cdot x^3$$

$$\text{SolFinalTres} := y^3 + 1 = _CI x^3 \quad (112)$$

$$> \text{SolFinalCuatro} := \frac{\text{lhs}(\text{SolFinalTres})}{x^3} = \frac{\text{rhs}(\text{SolFinalTres})}{x^3}$$

$$\text{SolFinalCuatro} := \frac{y^3 + 1}{x^3} = _CI \quad (113)$$

> Ecua

$$x y(x)^2 \left(\frac{d}{dx} y(x) \right) - y(x)^3 - 1 = 0 \quad (114)$$

$$> \text{SolucionFinal} := \frac{y(x)^3 + 1}{x^3} = _CI$$

$$\text{SolucionFinal} := \frac{y(x)^3 + 1}{x^3} = _CI \quad (115)$$

$$\begin{aligned} &> \text{DerSolucionFinal} := \text{isolate}(\text{diff}(\text{SolucionFinal}, x), \text{diff}(y(x), x)) \\ &\quad \text{DerSolucionFinal} := \frac{d}{dx} y(x) = \frac{y(x)^3 + 1}{x y(x)^2} \end{aligned} \tag{116}$$

$$\begin{aligned} &> \text{DerEcua} := \text{isolate}(\text{Ecua}, \text{diff}(y(x), x)) \\ &\quad \text{DerEcua} := \frac{d}{dx} y(x) = \frac{y(x)^3 + 1}{x y(x)^2} \end{aligned} \tag{117}$$

$$\begin{aligned} &> \text{Comprobar} := \text{rhs}(\text{DerSolucionFinal}) - \text{rhs}(\text{DerEcua}) = 0 \\ &\quad \text{Comprobar} := 0 = 0 \end{aligned} \tag{118}$$

> restart

>

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>

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