> *restart*

> $Ecua := \left(2 \, x \cdot y(x)^2 - 18 \cdot x^2 \cdot y(x) + 4 \cdot y(x)^3\right) + \left(2 \cdot x^2 \cdot y(x) - 6 \cdot x^3 + 12 \cdot x \cdot y(x)^2\right) \cdot diff(y(x), x) = 0$

$$Ecua := 2 \, x \, y(x)^2 - 18 \, x^2 \, y(x) + 4 \, y(x)^3 + \left(2 \, x^2 \, y(x) - 6 \, x^3 + 12 \, x \, y(x)^2\right)\left(\frac{d}{dx} \, y(x)\right) = 0 \qquad \textbf{(1)}$$

> *with(DEtools)* :

> *odeadvisor(Ecua)*

$$[[\,\_homogeneous, \, class \; A\,], \, \_exact, \, \_rational, \, \_dAlembert] \qquad \textbf{(2)}$$

> $M := 2 \, x \cdot y^2 - 18 \cdot x^2 \cdot y + 4 \cdot y^3$

$$M := -18 \, x^2 \, y + 2 \, x \, y^2 + 4 \, y^3 \qquad \textbf{(3)}$$

> $N := 2 \cdot x^2 \cdot y - 6 \cdot x^3 + 12 \cdot x \cdot y^2$

$$N := -6 \, x^3 + 2 \, x^2 \, y + 12 \, x \, y^2 \qquad \textbf{(4)}$$

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

$$Comprobar := 0 = 0 \qquad \textbf{(5)}$$

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

$$IntMx := -6 \, x^3 \, y + x^2 \, y^2 + 4 \, x \, y^3 \qquad \textbf{(6)}$$

> $SolGralUno := IntMx + int((N - diff(IntMx, y)), y) = \_C1$

$$SolGralUno := -6 \, x^3 \, y + x^2 \, y^2 + 4 \, x \, y^3 = \_C1 \qquad \textbf{(7)}$$

> $IntNy := int(N, y)$

$$IntNy := -6 \, x^3 \, y + x^2 \, y^2 + 4 \, x \, y^3 \qquad \textbf{(8)}$$

> $SolGralDos := IntNy + int((M - diff(IntNy, x)), x) = \_C2$

$$SolGralDos := -6 \, x^3 \, y + x^2 \, y^2 + 4 \, x \, y^3 = \_C2 \qquad \textbf{(9)}$$

> *Ecua*

$$2 \, x \, y(x)^2 - 18 \, x^2 \, y(x) + 4 \, y(x)^3 + \left(2 \, x^2 \, y(x) - 6 \, x^3 + 12 \, x \, y(x)^2\right)\left(\frac{d}{dx} \, y(x)\right) = 0 \qquad \textbf{(10)}$$

> *M*

$$-18 \, x^2 \, y + 2 \, x \, y^2 + 4 \, y^3 \qquad \textbf{(11)}$$

> *N*

$$-6 \, x^3 + 2 \, x^2 \, y + 12 \, x \, y^2 \qquad \textbf{(12)}$$

> $Mlambda := factor(subs(x = lambda \cdot x, \, y = lambda \cdot y, \, M))$

$$Mlambda := -2 \, \lambda^3 \, y \left(9 \, x^2 - x \, y - 2 \, y^2\right) \qquad \textbf{(13)}$$

> $Nlambda := factor(subs(x = lambda \cdot x, \, y = lambda \cdot y, \, N))$

$$Nlambda := -2 \, \lambda^3 \, x \left(3 \, x^2 - x \, y - 6 \, y^2\right) \qquad \textbf{(14)}$$

>

> $EcuaDos := factor(isolate(simplify(eval(subs(y(x) = x \cdot u(x), \, Ecua))), \, diff(u(x), x)))$

$$EcuaDos := \frac{d}{dx} \, u(x) = -\frac{2 \, u(x) \left(4 \, u(x)^2 + u(x) - 6\right)}{x \left(6 \, u(x)^2 + u(x) - 3\right)} \qquad \textbf{(15)}$$

> $P := 1; \; Q := 2 \, u \cdot \left(4 \, u^2 + u - 6\right)$

$$P := 1$$

$$Q := 2 \, u \left(4 \, u^2 + u - 6\right) \qquad \textbf{(16)}$$

> $R := x;\ S := 6\,u^2 + u - 3$

$$R := x \tag{17}$$
$$S := 6\,u^2 + u - 3$$

> $SolGralTres := int\left(\dfrac{P}{R},\,x\right) + int\left(\dfrac{S}{Q},\,u\right) = \_C3$

$$SolGralTres := \ln(x) + \frac{1}{4}\,\ln\left(u\left(4\,u^2 + u - 6\right)\right) = \_C3 \tag{18}$$

> $SolGralTresMedio := simplify(\exp(lhs(SolGralTres))) = \_C3$

$$SolGralTresMedio := x\left(u\left(4\,u^2 + u - 6\right)\right)^{1/4} = \_C3 \tag{19}$$

> $SolGralCuatro := expand\left(subs\left(u = \dfrac{y}{x},\,SolGralTresMedio\right)\right)$

$$SolGralCuatro := x\left(\frac{4\,y^3}{x^3} + \frac{y^2}{x^2} - \frac{6\,y}{x}\right)^{1/4} = \_C3 \tag{20}$$

> $SolGralCinco := expand\left((lhs(SolGralCuatro))^4\right) = \_C3$

$$SolGralCinco := -6\,x^3\,y + x^2\,y^2 + 4\,x\,y^3 = \_C3 \tag{21}$$

> $SolGralUno$

$$-6\,x^3\,y + x^2\,y^2 + 4\,x\,y^3 = \_C1 \tag{22}$$

> $SolGralDos$

$$-6\,x^3\,y + x^2\,y^2 + 4\,x\,y^3 = \_C2 \tag{23}$$

> $restart$

> $Ecuacion := \left(x^3 + x\cdot y(x)^2\right) + \left(x^2\cdot y(x) + y(x)^3\right)\cdot diff(y(x),\,x) = 0$

$$Ecuacion := x^3 + x\,y(x)^2 + \left(x^2\,y(x) + y(x)^3\right)\left(\frac{d}{dx}\,y(x)\right) = 0 \tag{24}$$

> $with(DEtools):$

> $odeadvisor(Ecuacion)$

$$[\_separable] \tag{25}$$

> $M := x^3 + x\cdot y^2$

$$M := x^3 + x\,y^2 \tag{26}$$

> $N := x^2\,y + y^3$

$$N := x^2\,y + y^3 \tag{27}$$

> $Comprobar := diff(M,\,y) = diff(N,\,x)$

$$Comprobar := 2\,x\,y = 2\,x\,y \tag{28}$$

> $IntMx := int(M,\,x)$

$$IntMx := \frac{1}{4}\,x^4 + \frac{1}{2}\,x^2\,y^2 \tag{29}$$

> $SolGral := IntMx + int((N - diff(IntMx,\,y)),\,y) = \_C1$

$$SolGral := \frac{1}{4}\,x^4 + \frac{1}{2}\,x^2\,y^2 + \frac{1}{4}\,y^4 = \_C1 \tag{30}$$

> $Ecuacion$

$$x^3 + x\,y(x)^2 + \left(x^2\,y(x) + y(x)^3\right)\left(\frac{d}{dx}\,y(x)\right) = 0 \tag{31}$$

> $EcuaDos := simplify(isolate(eval(subs(y(x) = x \cdot u(x), Ecuacion)), diff(u(x), x)))$

$$EcuaDos := \frac{d}{dx} u(x) = -\frac{u(x)^2 + 1}{x\, u(x)} \tag{32}$$

> $P := 1; Q := u^2 + 1; R := x; S := u$

$$P := 1$$
$$Q := u^2 + 1$$
$$R := x$$
$$S := u \tag{33}$$

> $SolGralDos := int\left(\frac{P}{R}, x\right) + int\left(\frac{S}{Q}, u\right) = \_C2$

$$SolGralDos := \ln(x) + \frac{1}{2} \ln(u^2 + 1) = \_C2 \tag{34}$$

> $SolGralTres := subs\left(u = \frac{y}{x}, SolGralDos\right)$

$$SolGralTres := \ln(x) + \frac{1}{2} \ln\left(\frac{y^2}{x^2} + 1\right) = \_C2 \tag{35}$$

> $SolGralCuatro := expand\left(\left(\left(simplify(\exp(lhs(SolGralTres)))\right)^2\right)^2\right) = \_C2$

$$SolGralCuatro := x^4 + 2 x^2 y^2 + y^4 = \_C2 \tag{36}$$

> $SolGralUno := 4 \cdot lhs(SolGral) = rhs(SolGral)$

$$SolGralUno := x^4 + 2 x^2 y^2 + y^4 = \_C1 \tag{37}$$

>