> *restart*

> $Ecua := \left(\dfrac{x}{\text{sqrt}(x^2 + y(x)^2)} + \dfrac{1}{x} + \dfrac{1}{y(x)} \right) + \left(\dfrac{y(x)}{\text{sqrt}(x^2 + y(x)^2)} + \dfrac{1}{y(x)} - \dfrac{x}{y(x)^2} \right)$
> $\cdot diff(y(x), x) = 0$

$$Ecua := \dfrac{x}{\sqrt{x^2 + y(x)^2}} + \dfrac{1}{x} + \dfrac{1}{y(x)} + \left(\dfrac{y(x)}{\sqrt{x^2 + y(x)^2}} + \dfrac{1}{y(x)} - \dfrac{x}{y(x)^2} \right) \left(\dfrac{d}{dx} y(x) \right) = 0 \qquad \textbf{(1)}$$

> *with(DEtools)* :

> *odeadvisor(Ecua)*

$$[\_exact] \qquad \textbf{(2)}$$

> $M := \dfrac{x}{\sqrt{x^2 + y^2}} + \dfrac{1}{x} + \dfrac{1}{y}$

$$M := \dfrac{x}{\sqrt{x^2 + y^2}} + \dfrac{1}{x} + \dfrac{1}{y} \qquad \textbf{(3)}$$

> $N := \dfrac{y}{\sqrt{x^2 + y^2}} + \dfrac{1}{y} - \dfrac{x}{y^2}$

$$N := \dfrac{y}{\sqrt{x^2 + y^2}} + \dfrac{1}{y} - \dfrac{x}{y^2} \qquad \textbf{(4)}$$

> $DerMy := diff(M, y)$

$$DerMy := - \dfrac{x\,y}{\left(x^2 + y^2\right)^{3/2}} - \dfrac{1}{y^2} \qquad \textbf{(5)}$$

> $DerNx := diff(N, x)$

$$DerNx := - \dfrac{x\,y}{\left(x^2 + y^2\right)^{3/2}} - \dfrac{1}{y^2} \qquad \textbf{(6)}$$

> $Comprobar := DerMy - DerNx = 0$

$$Comprobar := 0 = 0 \qquad \textbf{(7)}$$

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

$$IntMx := \sqrt{x^2 + y^2} + \ln(x) + \dfrac{x}{y} \qquad \textbf{(8)}$$

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

$$SolGral := \sqrt{x^2 + y^2} + \ln(x) + \dfrac{x}{y} + \ln(y) = \_C1 \qquad \textbf{(9)}$$

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

$$IntNy := \sqrt{x^2 + y^2} + \ln(y) + \dfrac{x}{y} \qquad \textbf{(10)}$$

> $SolGralDos := IntNy + int((M - diff(IntNy, x)), x) = \_C1$

$$SolGralDos := \sqrt{x^2 + y^2} + \ln(x) + \dfrac{x}{y} + \ln(y) = \_C1 \qquad \textbf{(11)}$$

> *restart*

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

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

```
> with(DEtools) :
> odeadvisor(Ecua)
```
$$[\_exact, \_rational] \tag{13}$$

```
> M := 4 x^3 y^2 + 3 x^2 y^3 + 2 x
```
$$M := 4\,x^3\,y^2 + 3\,x^2\,y^3 + 2\,x \tag{14}$$

```
> N := 2 x^4 y + 3 x^3 y^2
```
$$N := 2\,x^4\,y + 3\,x^3\,y^2 \tag{15}$$

```
> IntMx := int(M, x)
```
$$IntMx := x^4\,y^2 + x^3\,y^3 + x^2 \tag{16}$$

```
> SolGral := IntMx + int((N - diff(IntMx, y)), y) = _C1
```
$$SolGral := x^4\,y^2 + x^3\,y^3 + x^2 = \_C1 \tag{17}$$

```
> EcuaDos := (4·x^2·y(x)^2 + 3·x·y(x)^3 + 2) + (2·x^3·y(x) + 3·x^2·y(x)^2)·diff(y(x), x) = 0
```
$$EcuaDos := 4\,x^2\,y(x)^2 + 3\,x\,y(x)^3 + 2 + \left(2\,x^3\,y(x) + 3\,x^2\,y(x)^2\right)\left(\frac{d}{dx}\,y(x)\right) = 0 \tag{18}$$

```
> odeadvisor(EcuaDos)
```
$$[\_rational] \tag{19}$$

```
> FactInt := intfactor(EcuaDos)
```
$$FactInt := x \tag{20}$$

```
> EcuaTres := simplify(FactInt·(EcuaDos))
```
$$EcuaTres := x\left(3\,y(x)^2\left(\frac{d}{dx}\,y(x)\right)x^2 + 2\,y(x)\left(\frac{d}{dx}\,y(x)\right)x^3 + 3\,x\,y(x)^3 + 4\,x^2\,y(x)^2 + 2\right) \tag{21}$$
$$= 0$$

```
> odeadvisor(EcuaTres)
```
$$[\_exact, \_rational] \tag{22}$$

```
> restart
> Ecua := (2·x·y(x)^2 - 3·y(x)^3) + (7 - 3·x·y(x)^2)·diff(y(x), x) = 0
```
$$Ecua := 2\,x\,y(x)^2 - 3\,y(x)^3 + \left(7 - 3\,x\,y(x)^2\right)\left(\frac{d}{dx}\,y(x)\right) = 0 \tag{23}$$

```
> with(DEtools) :
> odeadvisor(Ecua)
```
$$[\_rational] \tag{24}$$

```
> M := 2·x·y^2 - 3·y^3
```
$$M := 2\,x\,y^2 - 3\,y^3 \tag{25}$$

```
> N := 7 - 3 x y^2
```
$$N := -3\,x\,y^2 + 7 \tag{26}$$

```
> DerMy := diff(M, y)
```
$$DerMy := 4\,x\,y - 9\,y^2 \tag{27}$$

```
> DerNx := diff(N, x)
```
$$DerNx := -3\,y^2 \tag{28}$$

```
> EcuaFactInt := int(1/g, g) = int((DerNx - DerMy)/M, y)
```

$$\tag{29}$$

$$EcuaFactInt := \ln(g) = -2\ln(y) \tag{29}$$

> $isolate(EcuaFactInt, g)$

$$g = \frac{1}{y^2} \tag{30}$$

> $intfactor(Ecua)$

$$\frac{1}{y(x)^2} \tag{31}$$

> $FactInt := \dfrac{1}{y(x)^2}$

$$FactInt := \frac{1}{y(x)^2} \tag{32}$$

> $EcuaExacta := expand(FactInt \cdot Ecua)$

$$EcuaExacta := 2\,x - 3\,y(x) + \frac{7\left(\dfrac{d}{dx}\,y(x)\right)}{y(x)^2} - 3\left(\frac{d}{dx}\,y(x)\right)x = 0 \tag{33}$$

> $odeadvisor(EcuaExacta)$

$$[\_exact, \_rational] \tag{34}$$

> $MM := expand\left(\dfrac{(2\cdot x \cdot y^2 - 3\,y^3)}{y^2}\right)$

$$MM := 2\,x - 3\,y \tag{35}$$

> $NN := expand\left(\dfrac{(7 - 3\,x\,y^2)}{y^2}\right)$

$$NN := \frac{7}{y^2} - 3\,x \tag{36}$$

> $DerMMy := diff(MM, y)$

$$DerMMy := -3 \tag{37}$$

> $DerNNx := diff(NN, x)$

$$DerNNx := -3 \tag{38}$$

>