

```
> restart
> Ecuacion := 3·x·2 + 16·x·y(x) - 6·y(x) + 12·y(x)·2 + (8·x·2 - 6·x + 24·x·y(x) - 54
·y(x)·2)·diff(y(x), x) = 0
Ecuacion := 3 x^2 + 16 x y(x) - 6 y(x) + 12 y(x)^2 + (8 x^2 - 6 x + 24 x y(x)
- 54 y(x)^2) ( d/dx y(x) ) = 0
```

$$(1)$$

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> with(DEtools) :
> odeadvisor(Ecuacion)
[_exact, _rational]
```

$$(2)$$

```
> M := 3 x^2 + 16 x y - 6 y + 12 y^2
M := 3 x^2 + 16 x y - 6 y + 12 y^2
```

$$(3)$$

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> N := 8 x^2 - 6 x + 24 x y - 54 y^2
N := 8 x^2 - 6 x + 24 x y - 54 y^2
```

$$(4)$$

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> comprobacion := simplify(diff(M, y) - diff(N, x)) = 0
comprobacion := 0 = 0
```

$$(5)$$

```
> IntM := int(M, x)
IntM := x^3 + 8 x^2 y - 6 x y + 12 x y^2
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$$(6)$$

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> IntN := int(N, y)
IntN := -18 y^3 + 12 x y^2 + 8 x^2 y - 6 x y
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$$(7)$$

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> SolucionGeneralUno := IntM + int((N - diff(IntM, y)), y) = C1
SolucionGeneralUno := x^3 + 8 x^2 y - 6 x y + 12 x y^2 - 18 y^3 = C1
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$$(8)$$

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> SolucionGeneralDos := IntN + int((M - diff(IntN, x)), x) = C1
SolucionGeneralDos := x^3 + 8 x^2 y - 6 x y + 12 x y^2 - 18 y^3 = C1
```

$$(9)$$

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> restart
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219.  $\left(\frac{x}{\sqrt{x^2 + y^2}} + \frac{1}{x} + \frac{1}{y}\right) dx + \left(\frac{y}{\sqrt{x^2 + y^2}} + \frac{1}{y} - \frac{x}{y^2}\right) dy = 0.$

220.  $\left(3x^2 \lg y - \frac{2y^3}{x^3}\right) dx + \left(x^3 \sec^2 y + 4y^3 + \frac{3y^2}{x^2}\right) dy = 0.$

```
> Ecuacion := 3·x·2·tan(y(x)) - 2·y(x)·3/x^3 + (x·3·sec(y(x))·2 + 4·y(x)·3
+ 3·y(x)·2/x·2)·diff(y(x), x) = 0
Ecuacion := 3 x^2 tan(y(x)) - 2 y(x)^3/x^3 + (x^3 sec(y(x))^2 + 4 y(x)^3 + 3 y(x)^2/x^2) ( d/dx y(x) )
= 0
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$$(10)$$

> with(DEtools);  
 [AreSimilar, DEnormal, DEplot, DEplot3d, DEplot\_polygon, DFactor, DFactorLCLM, DFactorsols, Dchangevar, FunctionDecomposition, GCRD, Gosper, Heunsols, Homomorphisms, IVPsol, IsHyperexponential, LCLM, MeijerGsols, MultiplicativeDecomposition, ODEInvariants, PDEchangecoords, PolynomialNormalForm, RationalCanonicalForm, ReduceHyperexp, RiemannPsols, Xchange, Xcommutator, Xgauge, Zeilberger, abelsol, adjoint, autonomous, bernoullisol, buildsol, buildsym, canoni, caseplot, casesplit, checkrank, chinisol, clairautsol, constcoeffsols, convertAlg, convertsys, dalembertsol, dcoeffs, de2diffop, dfieldplot, diff\_table, diffop2de, dperiodic\_sols, dpolyform, dsubs, eigenring, endomorphism\_charpoly, equinv, eta\_k, eulersols, exactsol, expsols, exterior\_power, firint, firtest, formal\_sol, gen\_exp, generate\_ic, genhomosol, gensys, hamilton\_eqs, hypergeomsols, hyperode, indicialeq, infgen, initialdata, integrate\_sols, infactor, invariants, kovaciccsols, leftdivision, liesol, line\_int, linearsol, matrixDE, matrix\_riccati, maxdimsystems, moser\_reduce, muchange, mult, mutest, newton\_polygon, normalG2, ode\_int\_y, ode\_y1, odeadvisor, odepde, parametricsol, particularsol, phaseportrait, poincare, polysols, power\_equivalent, rational\_equivalent, ratsols, redode, reduceOrder, reduce\_order, regular\_parts, regularsp, remove\_RootOf, riccati\_system, riccatisol, rifread, rifsimp, rightdivision, rtaylor, separablesol, singularities, solve\_group, super\_reduce, symgen, symmetric\_power, symmetric\_product, symtest, transinv, translate, untranslate, varparam, zoom]

> odeadvisor(Ecuacion) [exact] (12)

$$M := 3x^2 \tan(y) - \frac{2y^3}{x^3}$$

$$M := 3x^2 \tan(y) - \frac{2y^3}{x^3} \quad (13)$$

$$N := x^3 \sec(y)^2 + 4y^3 + \frac{3y^2}{x^2}$$

$$N := x^3 \sec(y)^2 + 4y^3 + \frac{3y^2}{x^2} \quad (14)$$

> Comprobacion := simplify(diff(M, y) - diff(N, x)) = 0  
 Comprobacion := 0 = 0 (15)

> IntM := int(M, x)

$$IntM := x^3 \tan(y) + \frac{y^3}{x^2} \quad (16)$$

> SolucionGeneral := IntM + int((N - diff(IntM, y)), y) = C<sub>1</sub>

$$SolucionGeneral := \frac{y^3}{x^2} + \frac{x^3 \sin(y)}{\cos(y)} + y^4 = C_1 \quad (17)$$

> Solucion :=  $\frac{y(x)^3}{x^2} + \frac{x^3 \sin(y(x))}{\cos(y(x))} + y(x)^4 = C_1$

$$Solucion := \frac{y(x)^3}{x^2} + \frac{x^3 \sin(y(x))}{\cos(y(x))} + y(x)^4 = C_1 \quad (18)$$

> EcuacionOriginal := simplify(isolate(diff(Solucion, x), diff(y(x), x)))

$$EcuacionOriginal := \frac{d}{dx} y(x) = \frac{(2 y(x)^3 \cos(y(x)) - 3 x^5 \sin(y(x))) \cos(y(x))}{x (3 y(x)^2 \cos(y(x))^2 + x^5 + 4 y(x)^3 x^2 \cos(y(x))^2)} \quad (19)$$

> EcuacionDos := simplify(isolate(Ecuacion, diff(y(x), x)))

$$EcuacionDos := \frac{d}{dx} y(x) = \frac{(2 y(x)^3 \cos(y(x)) - 3 x^5 \sin(y(x))) \cos(y(x))}{x (3 y(x)^2 \cos(y(x))^2 + x^5 + 4 y(x)^3 x^2 \cos(y(x))^2)} \quad (20)$$

> Comprobacion<sub>2</sub> := simplify(rhs(EcuacionOriginal) - rhs(EcuacionDos)) = 0

$$Comprobacion_2 := 0 = 0 \quad (21)$$

> Sol := dsolve(Ecuacion)

$$Sol := x^3 \tan(y(x)) + \frac{y(x)^3}{x^2} + y(x)^4 + \_CI = 0 \quad (22)$$

> SolDos := exactsol(Ecuacion)

$$SolDos := \left\{ x^3 \tan(y(x)) + \frac{y(x)^3}{x^2} + y(x)^4 + \_CI = 0 \right\} \quad (23)$$

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