

```

> ec:=x*diff(y(x),x)=m*x^2+y(x)

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


> sol:=dsolve(ec,y(x))

$$sol := y(x) = (m x + c_1) x \quad (2)$$


> f:=unapply(rhs(sol),x,m,c_1)

$$f := (x, m, c_1) \mapsto (m \cdot x + c_1) \cdot x \quad (3)$$


> solve(f(1,m,c_1)=2,m)

$$2 - c_1 \quad (4)$$


> solve(f(3,2-c_1,c_1)=1,c_1)

$$\frac{17}{6} \quad (5)$$


> f(x,-5/6,17/6)

$$\left( -\frac{5 x}{6} + \frac{17}{6} \right) x \quad (6)$$


> restart
> with(plots)
[animate, animate3d, animatecurve, arrow, changecoords, complexplot, complexplot3d, conformal, (7)
conformal3d, contourplot, contourplot3d, coordplot, coordplot3d, densityplot, display,
dualaxisplot, fieldplot, fieldplot3d, gradplot, gradplot3d, implicitplot, implicitplot3d, inequal,
interactive, interactiveparams, intersectplot, listcontplot, listcontplot3d, listdensityplot, listplot,
listplot3d, loglogplot, logplot, matrixplot, multiple, odeplot, pareto, plotcompare, pointplot,
pointplot3d, polarplot, polygonplot, polygonplot3d, polyhedra_supported, polyhedraplot,
rootlocus, semilogplot, setcolors, setoptions, setoptions3d, shadebetween, spacecurve,
sparsematrixplot, surfdata, textplot, textplot3d, tubeplot]
> ec:=x^2*diff(y(x),x$2)-2*x*diff(y(x),x)+2*y(x)=0

$$ec := x^2 \left( \frac{d^2}{dx^2} y(x) \right) - 2 x \left( \frac{d}{dx} y(x) \right) + 2 y(x) = 0 \quad (8)$$


> dsolve(ec,y(x))

$$y(x) = c_1 x^2 + c_2 x \quad (9)$$


> cond:=y(1)=2,D(y)(1)=3

$$cond := y(1) = 2, D(y)(1) = 3 \quad (10)$$


> sol2:=dsolve({ec,cond},y(x))

$$sol2 := y(x) = x^2 + x \quad (11)$$

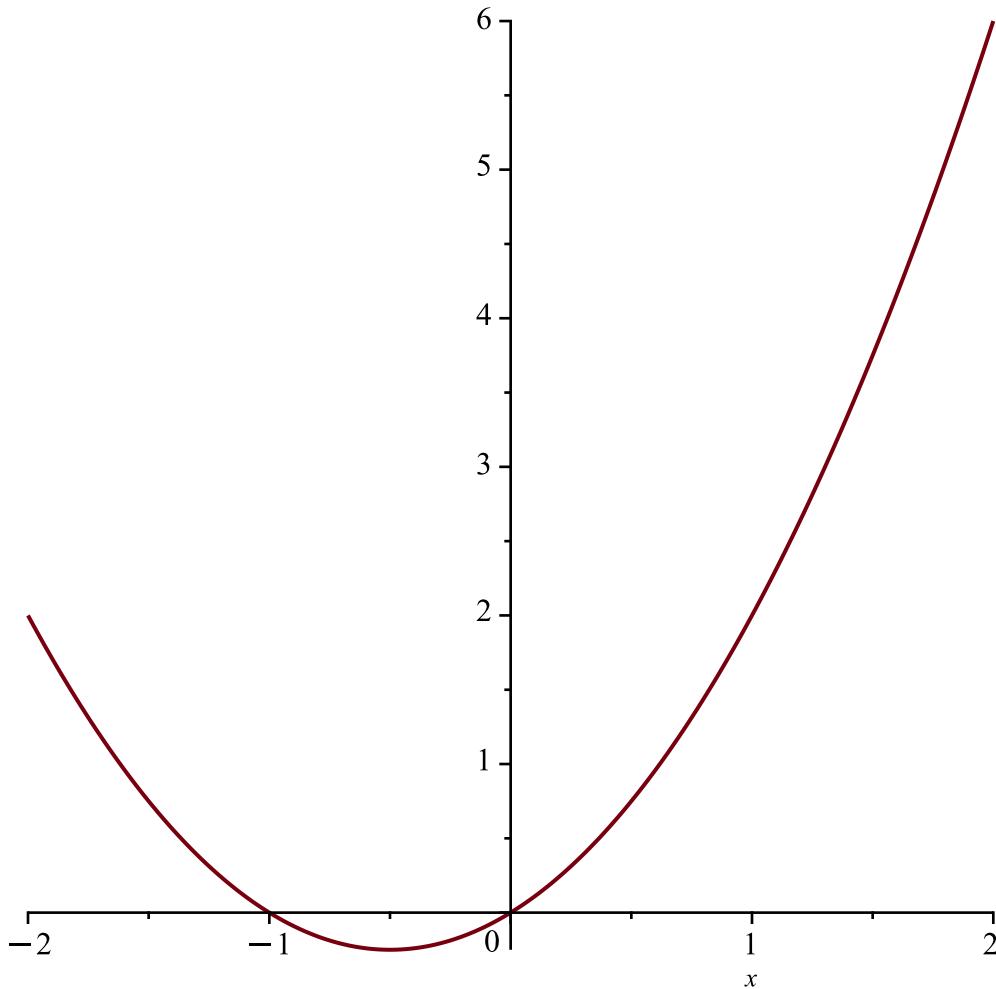

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```
> f:=unapply(rhs(sol2),x)
```

$$f := x \mapsto x^2 + x$$

(12)

```
> plot([f(x)],x=-2..2)
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> restart
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> with(DEtools)
```

[AreSimilar, Closure, DEnormal, DEplot, DEplot3d, DEplot\_polygon, DFactor, DFactorLCLM, (13)

DFactorsols, Dchangevar, Desingularize, FindODE, FunctionDecomposition, GCRD, Gosper, Heunsols, Homomorphisms, IVPsol, IsHyperexponential, LCLM, MeijerGsols, MultiplicativeDecomposition, ODEInvariants, PDEchangecoords, PolynomialNormalForm, RationalCanonicalForm, ReduceHyperexp, RiemannPsols, Xchange, Xcommutator, Xgauge, Zeilberger, abelsol, adjoint, autonomous, bernoullisols, buildsol, buildsym, canoni, caseplot, casesplit, checkrank, chinisol, clairautsol, constcoeffsols, convertAlg, convertsys, dalembertsols, dcoeffs, de2diffop, dfieldplot, diff\_table, diffop2de, dperiodic\_sols, dpolyform, dsubs, eigenring, endomorphism\_charpoly, equinv, eta\_k, eulersols, exactsol, expsols, exterior\_power, firint, firstest, formal\_sol, gen\_exp, generate\_ic, genhomosol, gensys,

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hamilton_eqs, hypergeometricsols, hypergeomsols, hyperode, indicialeq, infgen, initialdata,
integrate_sols, intfactor, invariants, kovacicsols, leftdivision, liesol, line_int, linesol,
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, rissimp, rightdivision, rtaylor, separablesol, singularities,
solve_group, super_reduce, symgen, symmetric_power, symmetric_product, symtest, transinv,
translate, untranslate, varparam, zoom]

```

>  $f := x \mapsto -x^3 + x^2 + 2 \cdot x$

$$f := x \mapsto -x^3 + x^2 + 2 \cdot x \quad (14)$$

>  $ec := \text{diff}(x(t), t) = f(x(t))$

$$ec := \frac{d}{dt} x(t) = -x(t)^3 + x(t)^2 + 2 x(t) \quad (15)$$

>  $\text{sol} := \text{solve}(f(x) = 0)$

$$sol := 0, 2, -1 \quad (16)$$

>  $D(f)(\text{sol}[1])$

$$2 \quad (17)$$

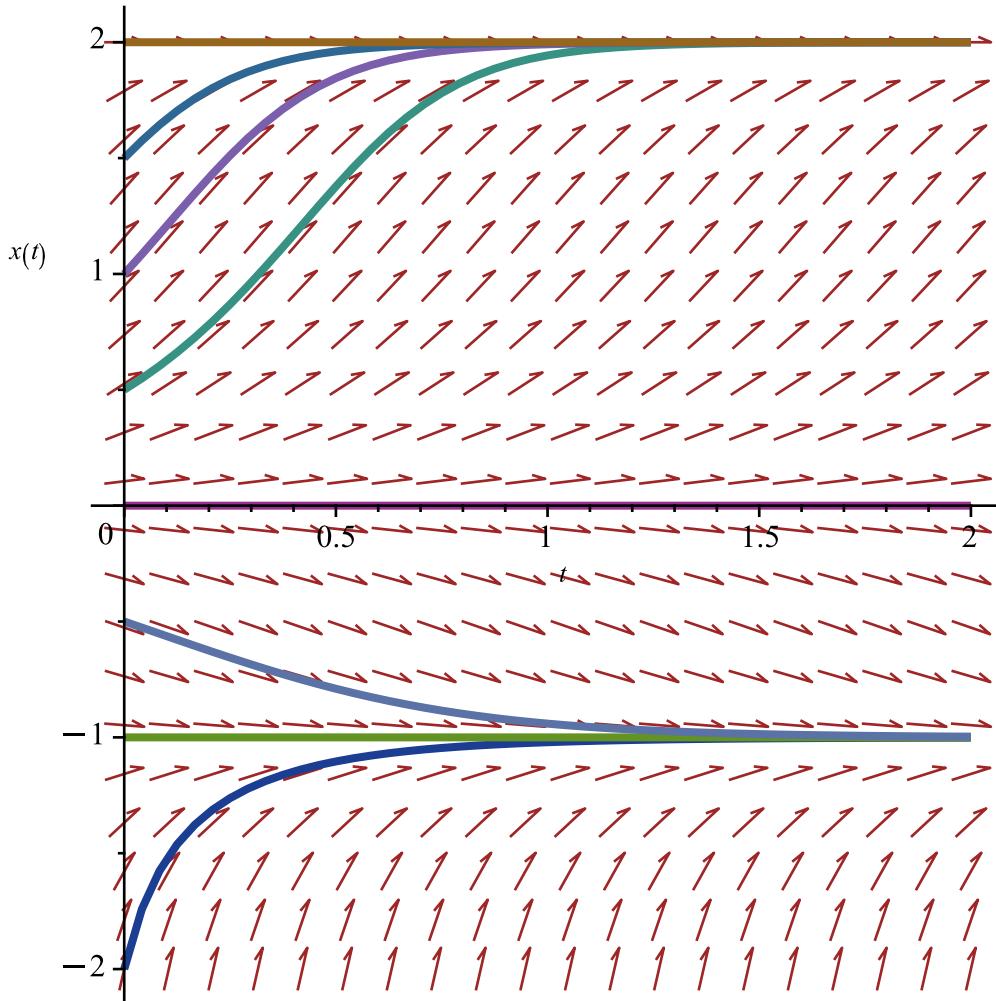
>  $D(f)(\text{sol}[2])$

$$-6 \quad (18)$$

>  $D(f)(\text{sol}[3])$

$$-3 \quad (19)$$

>  $\text{DEplot}(ec, x(t), t=0..2, [[x(0)=-2], [x(0)=-1], [x(0)=-1/2], [x(0)=0], [x(0)=1/2], [x(0)=1], [x(0)=3/2], [x(0)=2]])$



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> restart
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```
> ec1:=diff(y1(x),x)=9*y1(x)+21*y2(x)
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$$ec1 := \frac{d}{dx} y1(x) = 9 y1(x) + 21 y2(x) \quad (20)$$

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> ec2:=diff(y2(x),x)=-2*y1(x)-4*y2(x)
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$$ec2 := \frac{d}{dx} y2(x) = -2 y1(x) - 4 y2(x) \quad (21)$$

```
> sist:=ec1,ec2
```

$$sist := \frac{d}{dx} y1(x) = 9 y1(x) + 21 y2(x), \frac{d}{dx} y2(x) = -2 y1(x) - 4 y2(x) \quad (22)$$

```
> dsolve({sist},{y1(x),y2(x)})
```

$$\left\{ y1(x) = c_1 e^{3x} + c_2 e^{2x}, y2(x) = -\frac{2 c_1 e^{3x}}{7} - \frac{c_2 e^{2x}}{3} \right\} \quad (23)$$

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> cond:=y1(0)=2,y2(0)=5
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$$cond := y1(0) = 2, y2(0) = 5 \quad (24)$$

```
> dsolve({sist,cond},{y1(x),y2(x)})
```

$$\left[ \begin{array}{l} \{y1(x) = 119 e^{3x} - 117 e^{2x}, y2(x) = -34 e^{3x} + 39 e^{2x}\} \\ \end{array} \right] \quad (25)$$