

**> with (DEtools)**

[AreSimilar, Closure, DENormal, DEplot, DEplot3d, DEplot\_polygon, DFactor, (1)  
DFactorLCLM, 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, 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, hypergeometricsols, hypergeomsols,  
hyperode, indicialeq, infgen, initialdata, integrate\_sols, intfactor,  
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]

**> with (plots)**

[animate, animate3d, animatecurve, arrow, changecoords, complexplot, (2)  
complexplot3d, conformal, 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]

**> ecdf1:=diff(y(x),x) = 2\*x\*(1+y(x)^2)**

$$ecdif1 := \frac{d}{dx} y(x) = 2x(1 + y(x)^2) \quad (3)$$

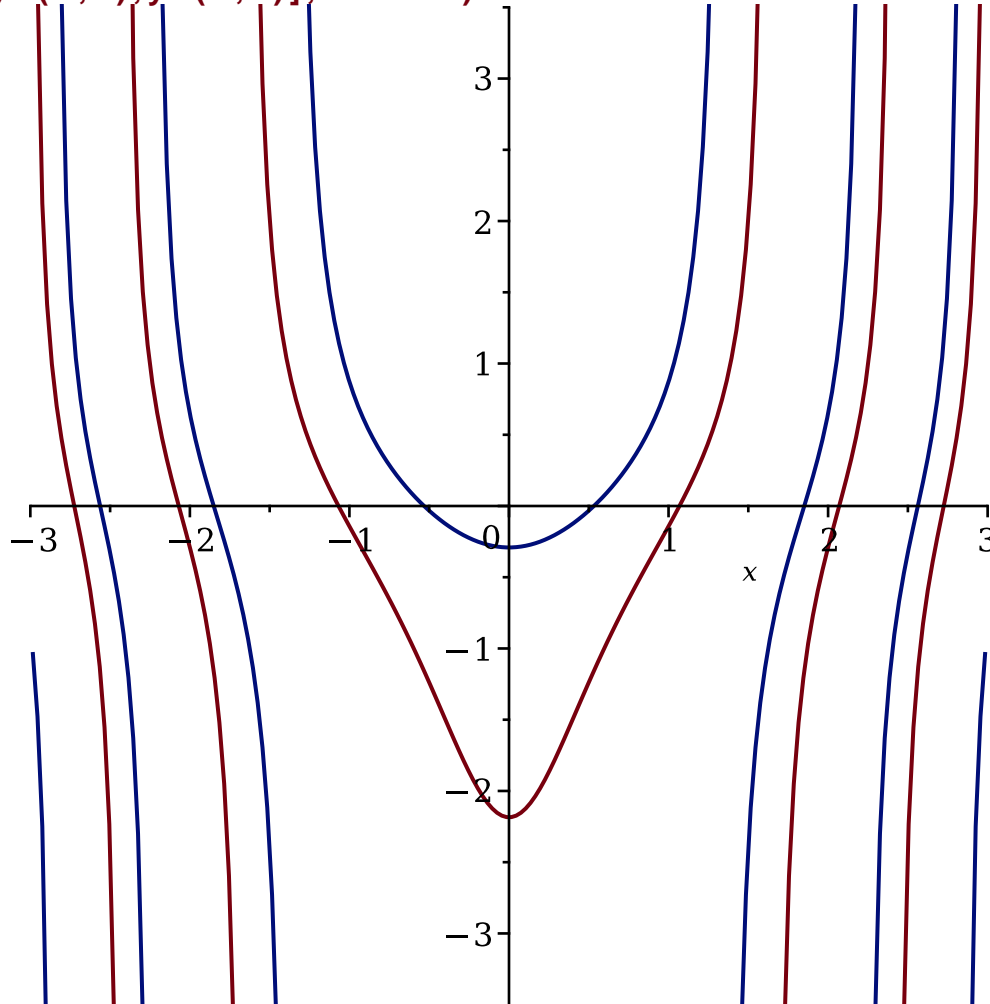
```
> sol1:=dsolve(ecdif1,y(x));
```

$$sol1 := y(x) = \tan(x^2 + 2c_1) \quad (4)$$

```
> y1:=unapply(rhs(sol1),x,c__1)
```

$$y1 := (x, c_1) \mapsto \tan(x^2 + 2 \cdot c_1) \quad (5)$$

```
> plot([y1(x,1),y1(x,3)],x=-3..3)
```



```
> ecdif1:=(x^2-1)*diff(y(x),x)+2*x*(y(x))^2=0
```

$$ecdif1 := (x^2 - 1) \left( \frac{d}{dx} y(x) \right) + 2y(x)^2 x = 0 \quad (6)$$

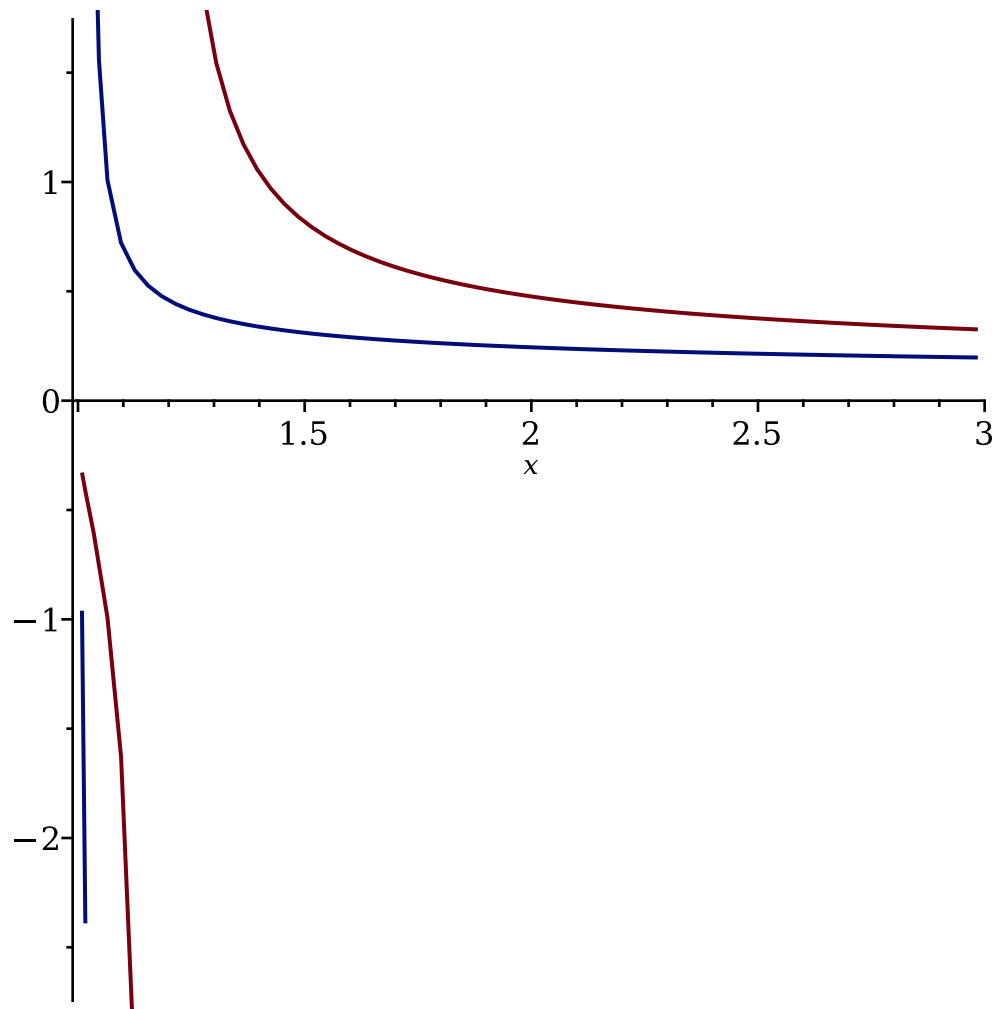
```
> sol1:=dsolve(ecdif1,y(x));
```

$$sol1 := y(x) = \frac{1}{\ln(x-1) + \ln(x+1) + c_1} \quad (7)$$

```
> y1:=unapply(rhs(sol1),x,c__1)
```

$$y1 := (x, c_1) \mapsto \frac{1}{\ln(x-1) + \ln(x+1) + c_1} \quad (8)$$

```
> plot([y1(x,1),y1(x,3)],x=-3..3)
```



```
> ecdif1:=2*x^2*diff(y(x),x) = x^2+(y(x))^2
```

$$ecdif1 := 2 \left( \frac{d}{dx} y(x) \right) x^2 = x^2 + y(x)^2 \quad (9)$$

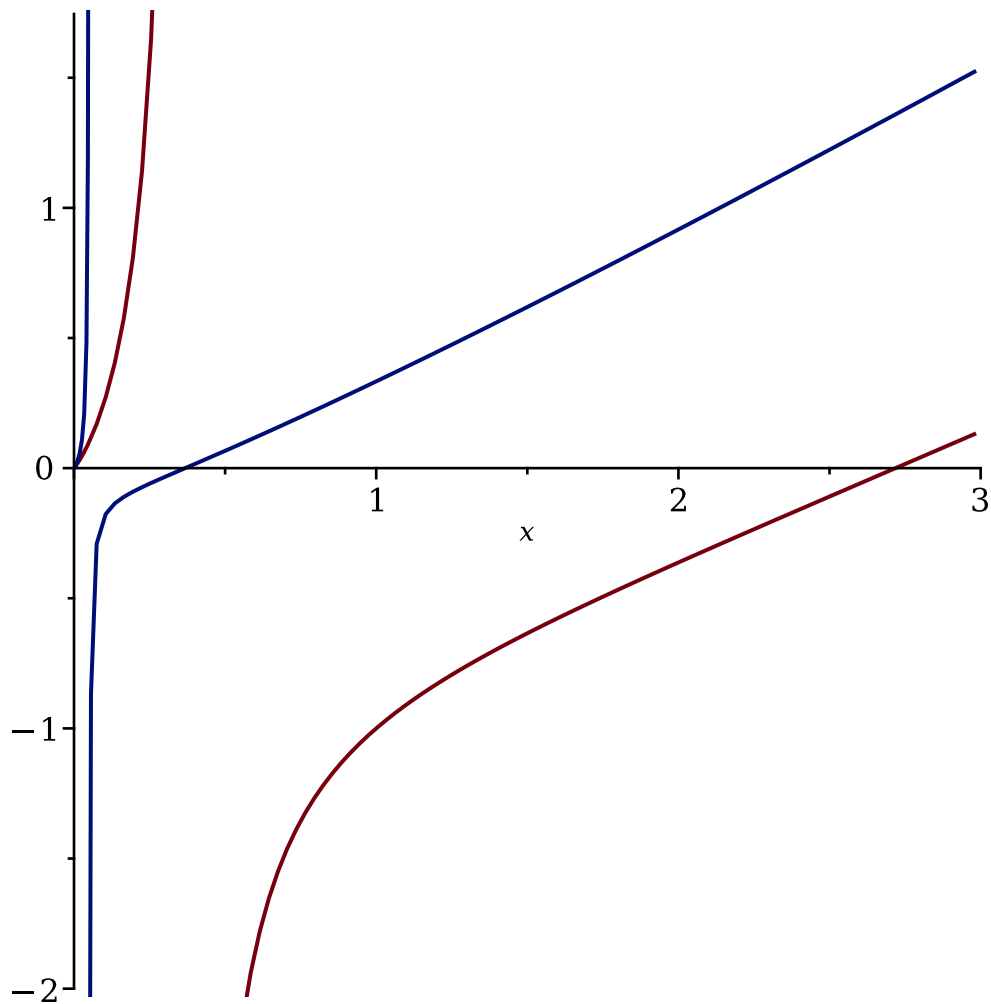
```
> sol1:=dsolve(ecdif1,y(x));
```

$$sol1 := y(x) = \frac{x (\ln(x) + c_1 - 2)}{\ln(x) + c_1} \quad (10)$$

```
> y1:=unapply(rhs(sol1),x,c__1)
```

$$y1 := (x, c_1) \mapsto \frac{x \cdot (\ln(x) + c_1 - 2)}{\ln(x) + c_1} \quad (11)$$

```
> plot([y1(x,1),y1(x,3)],x=-3..3)
```



```
> ecdif1:=diff(y(x),x)=-x/y(x)
```

$$ecdif1 := \frac{d}{dx} y(x) = -\frac{x}{y(x)} \quad (12)$$

```
> sol1:=dsolve(ecdif1,y(x));
```

$$sol1 := y(x) = \sqrt{-x^2 + c_1}, y(x) = -\sqrt{-x^2 + c_1} \quad (13)$$

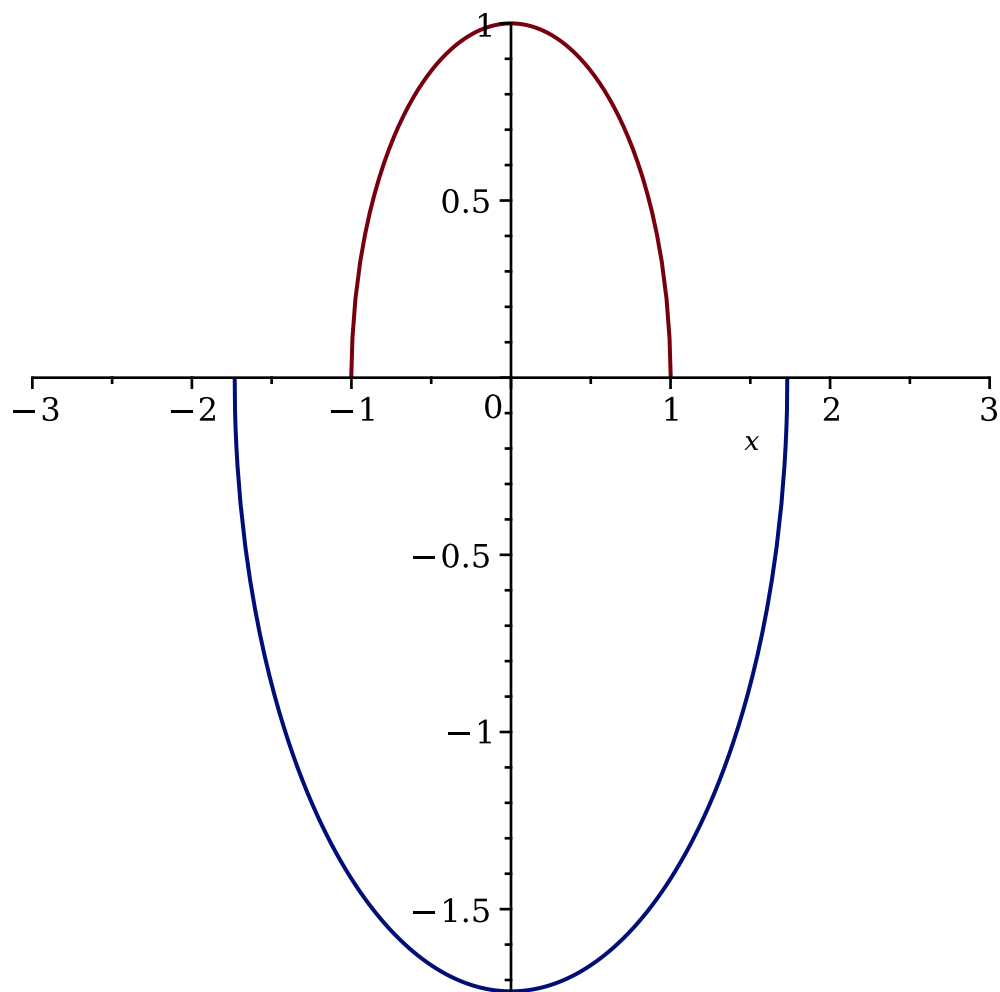
```
> y1:=unapply(rhs(sol1[1]),x,c__1)
```

$$y1 := (x, c_1) \mapsto \sqrt{-x^2 + c_1} \quad (14)$$

```
> y2:=unapply(rhs(sol1[2]),x,c__1)
```

$$y2 := (x, c_1) \mapsto -\sqrt{-x^2 + c_1} \quad (15)$$

```
> plot([y1(x,1),y2(x,3)],x=-3..3)
```



```
> ecdif1:=diff(y(x),x)=-x/(y(x))^3
```

$$ecdif1 := \frac{d}{dx} y(x) = -\frac{x}{y(x)^3} \quad (16)$$

```
> sol1:=dsolve(ecdif1,y(x));
```

$$sol1 := y(x) = (-2x^2 + c_1)^{1/4}, y(x) = -(-2x^2 + c_1)^{1/4}, y(x) = -I(-2x^2 + c_1)^{1/4}, y(x) = I(-2x^2 + c_1)^{1/4} \quad (17)$$

```
> y1:=unapply(rhs(sol1[1]),x,c__1)
```

$$y1 := (x, c_1) \mapsto (-2 \cdot x^2 + c_1)^{1/4} \quad (18)$$

```
> y2:=unapply(rhs(sol1[2]),x,c__1)
```

$$y2 := (x, c_1) \mapsto -(-2 \cdot x^2 + c_1)^{1/4} \quad (19)$$

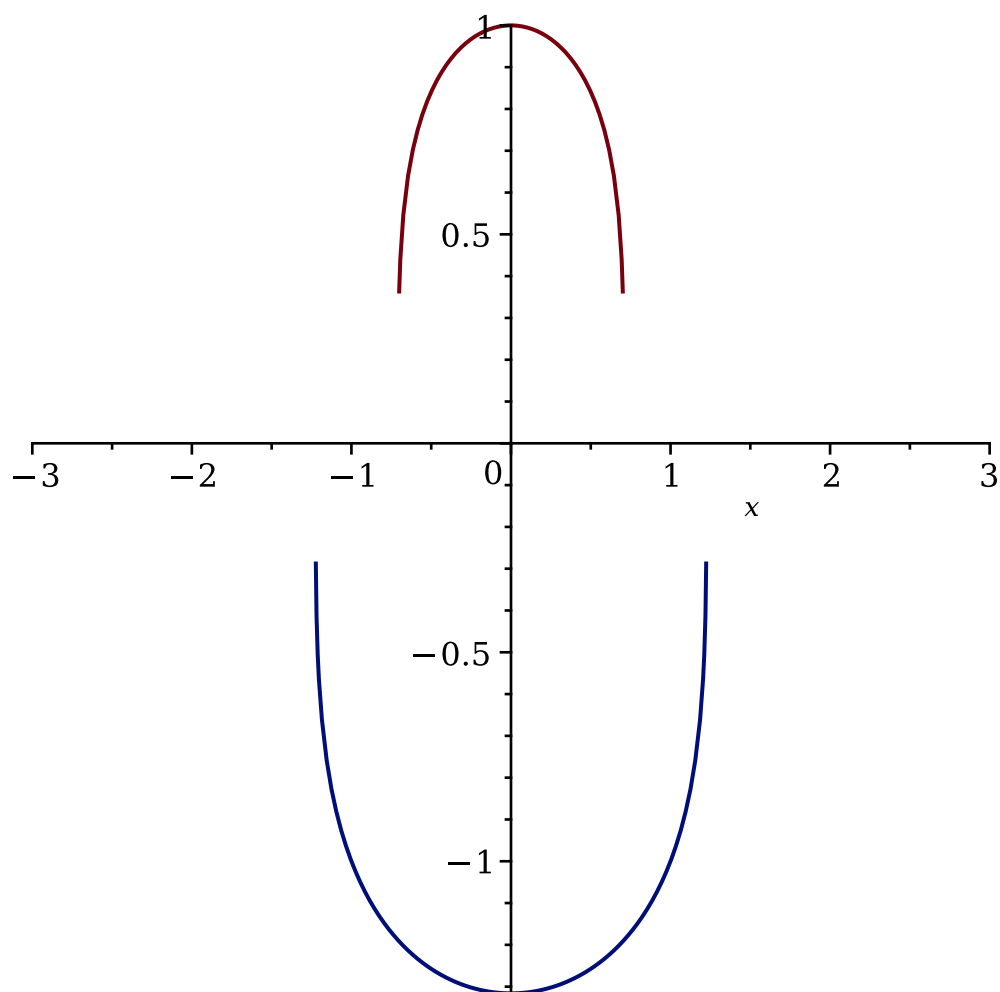
```
> y3:=unapply(rhs(sol1[3]),x,c__1)
```

$$y3 := (x, c_1) \mapsto -I \cdot (-2 \cdot x^2 + c_1)^{1/4} \quad (20)$$

```
> y4:=unapply(rhs(sol1[4]),x,c__1)
```

$$y4 := (x, c_1) \mapsto I \cdot (-2 \cdot x^2 + c_1)^{1/4} \quad (21)$$

```
> plot([y1(x,1),y2(x,3)],x=-3..3)
```



```
> ecdif1:=diff(y(x),x)=-(x+y(x))/y(x)
```

$$ecdif1 := \frac{d}{dx} y(x) = -\frac{x+y(x)}{y(x)} \quad (22)$$

```
> sol1:=dsolve(ecdif1,y(x));
```

```
sol1 := y(x) \quad (23)
```

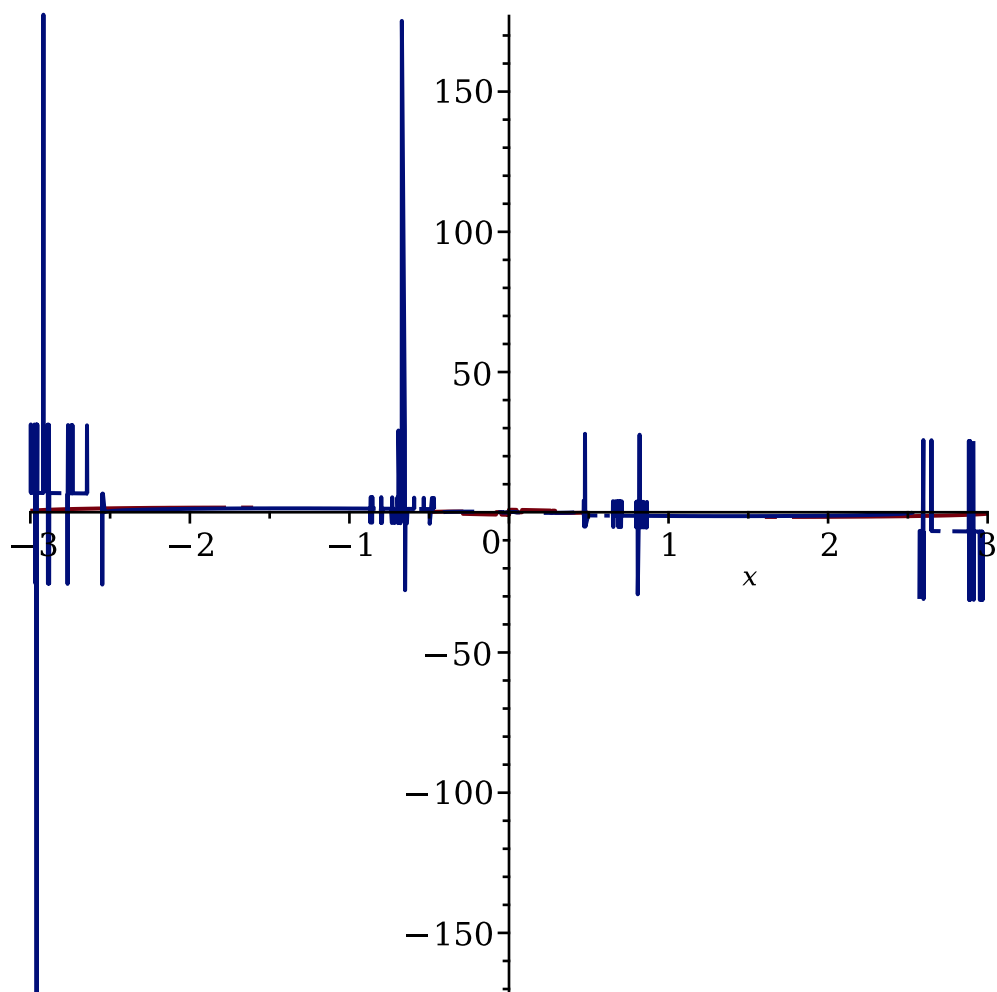
$$= \frac{\sqrt{3} x \tan\left(\text{RootOf}\left(\sqrt{3} \ln\left(\frac{3x^2}{4} + \frac{3x^2 \tan(Z)^2}{4}\right) + 2\sqrt{3} c_1 - 2Z\right)\right)}{2} - \frac{x}{2}$$

```
> y1:=unapply(rhs(sol1),x,c__1)
```

```
y1 := (x, c_1) \quad (24)
```

$$\mapsto \frac{\sqrt{3} \cdot x \cdot \tan\left(\text{RootOf}\left(\sqrt{3} \cdot \ln\left(\frac{3 \cdot x^2}{4} + \frac{3 \cdot x^2 \cdot \tan(Z)^2}{4}\right) + 2 \cdot \sqrt{3} \cdot c_1 - 2 \cdot Z\right)\right)}{2} - \frac{x}{2}$$

```
> plot([y1(x,1),y1(x,3)],x=-3..3)
```



```
> ecdif1:=diff(y(x),x)+y(x)*tan(x)=1/cos(x)
```

$$ecdif1 := \frac{d}{dx} y(x) + y(x) \tan(x) = \frac{1}{\cos(x)} \quad (25)$$

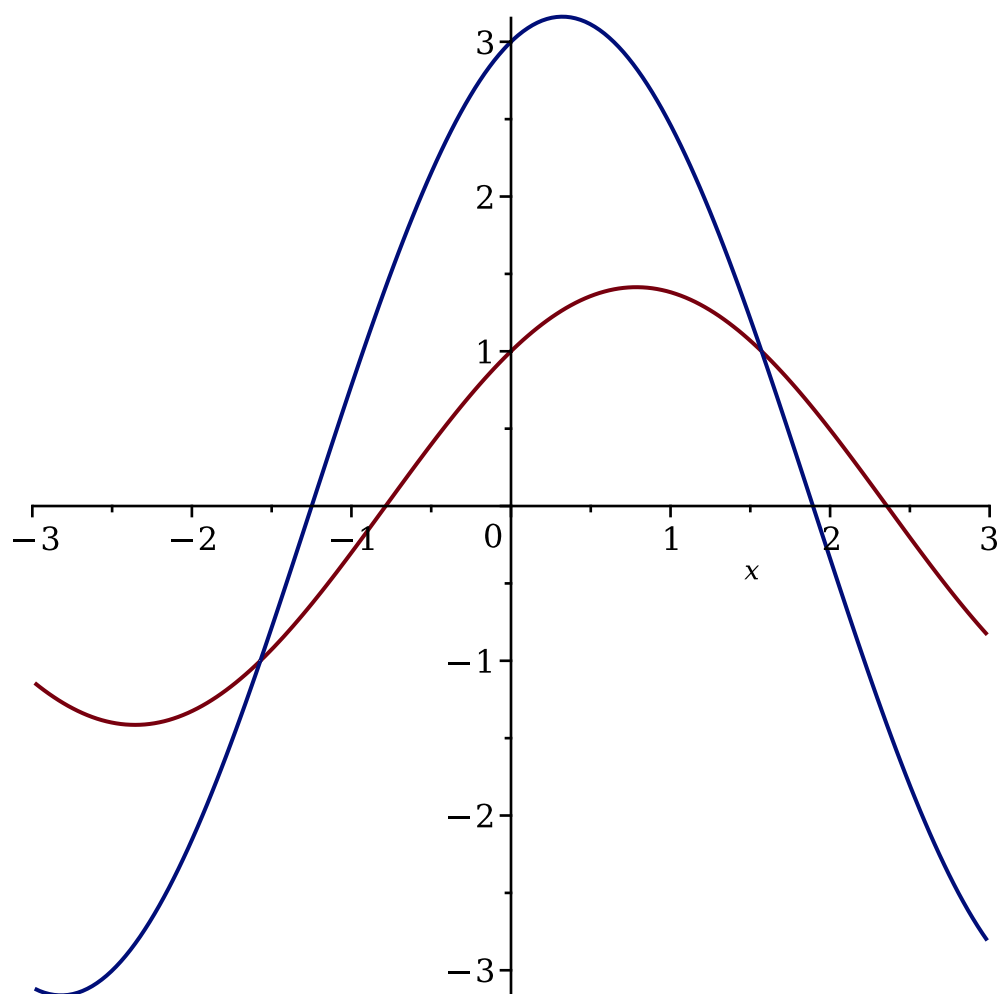
```
> sol1:=dsolve(ecdif1,y(x));
```

$$sol1 := y(x) = (\tan(x) + c_1) \cos(x) \quad (26)$$

```
> y1:=unapply(rhs(sol1),x,c__1)
```

$$y1 := (x, c_1) \mapsto (\tan(x) + c_1) \cdot \cos(x) \quad (27)$$

```
> plot([y1(x,1),y1(x,3)],x=-3..3)
```



```
> ecdif1:=diff(y(x),x)+2*y(x)/x=x^2
```

$$ecdif1 := \frac{d}{dx} y(x) + \frac{2y(x)}{x} = x^2 \quad (28)$$

```
> sol1:=dsolve(ecdif1,y(x));
```

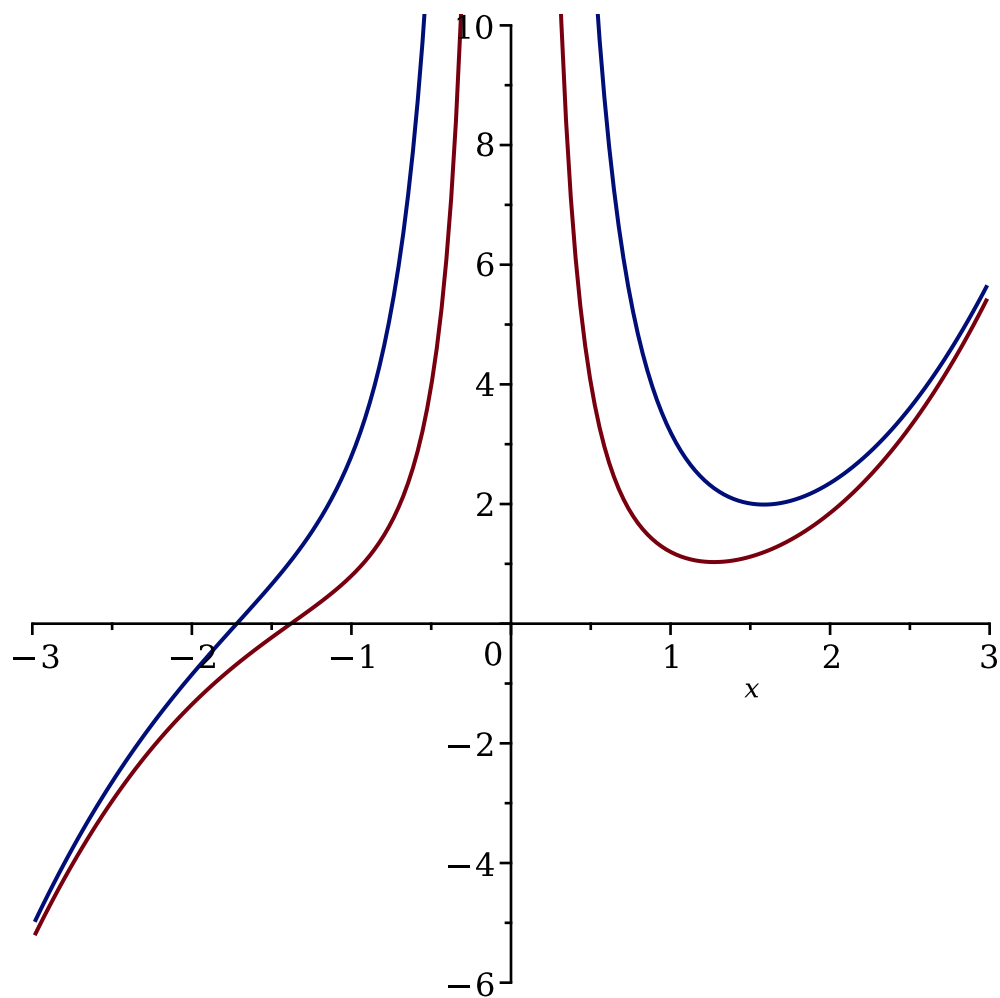
$$sol1 := y(x) = \frac{\frac{x^5}{5} + c_1}{x^2} \quad (29)$$

```
> y1:=unapply(rhs(sol1),x,c__1)
```

$$y1 := (x, c_1) \mapsto \frac{\frac{x^5}{5} + c_1}{x^2} \quad (30)$$

```
> plot([y1(x,1),y1(x,3)],x=-3..3)
```





```
> ecdif1:=diff(y(x),x,x)+y(x)=sin(x)+cos(x)
```

$$ecdif1 := \frac{d^2}{dx^2} y(x) + y(x) = \sin(x) + \cos(x) \quad (31)$$

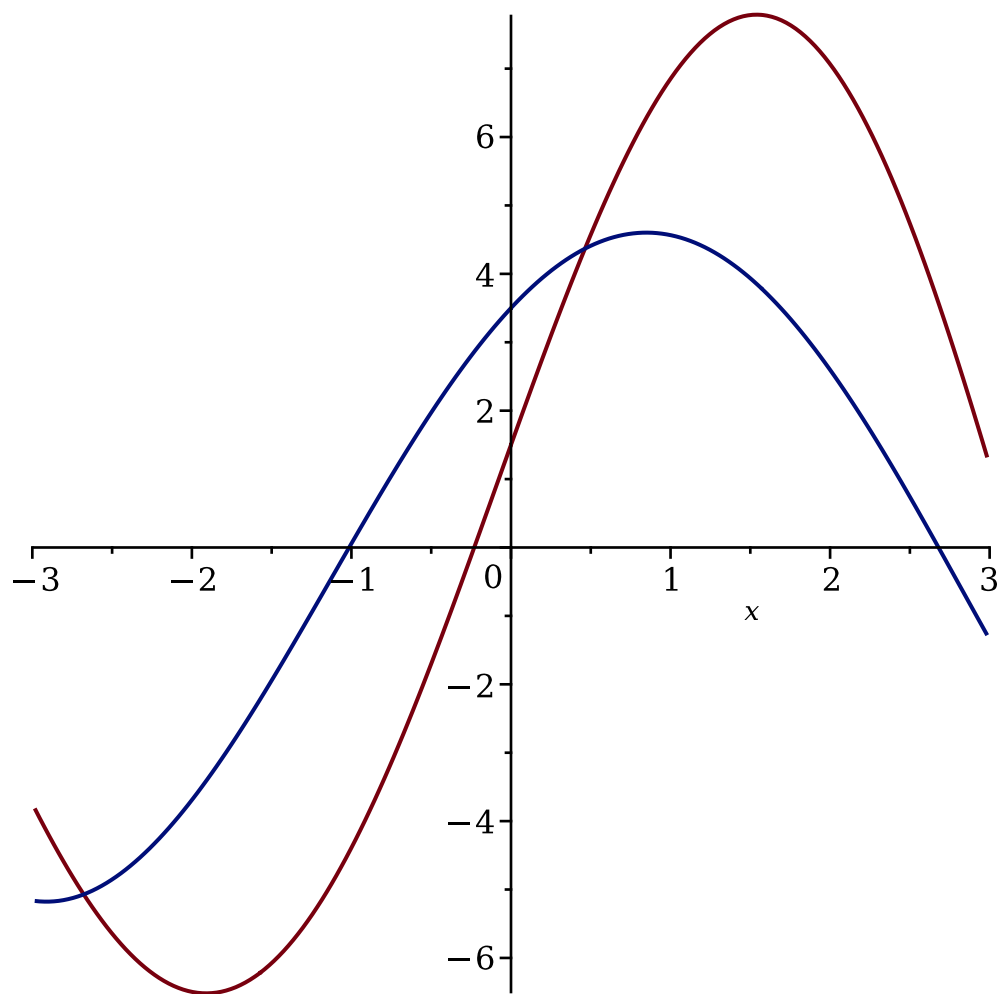
```
> sol1:=dsolve(ecdif1,y(x));
```

$$sol1 := y(x) = \sin(x) c_2 + \cos(x) c_1 + \frac{(1-x) \cos(x)}{2} + \frac{\sin(x) x}{2} \quad (32)$$

```
> y1:=unapply(rhs(sol1),x,c__1,c__2)
```

$$y1 := (x, c_1, c_2) \mapsto \sin(x) \cdot c_2 + \cos(x) \cdot c_1 + \frac{(1-x) \cdot \cos(x)}{2} + \frac{\sin(x) \cdot x}{2} \quad (33)$$

```
> plot([y1(x,1,7),y1(x,3,3)],x=-3..3)
```



```
> ecdif1:=diff(y(x),x$2)-y(x)=exp(2*x)
```

$$ecdif1 := \frac{d^2}{dx^2} y(x) - y(x) = e^{2x} \quad (34)$$

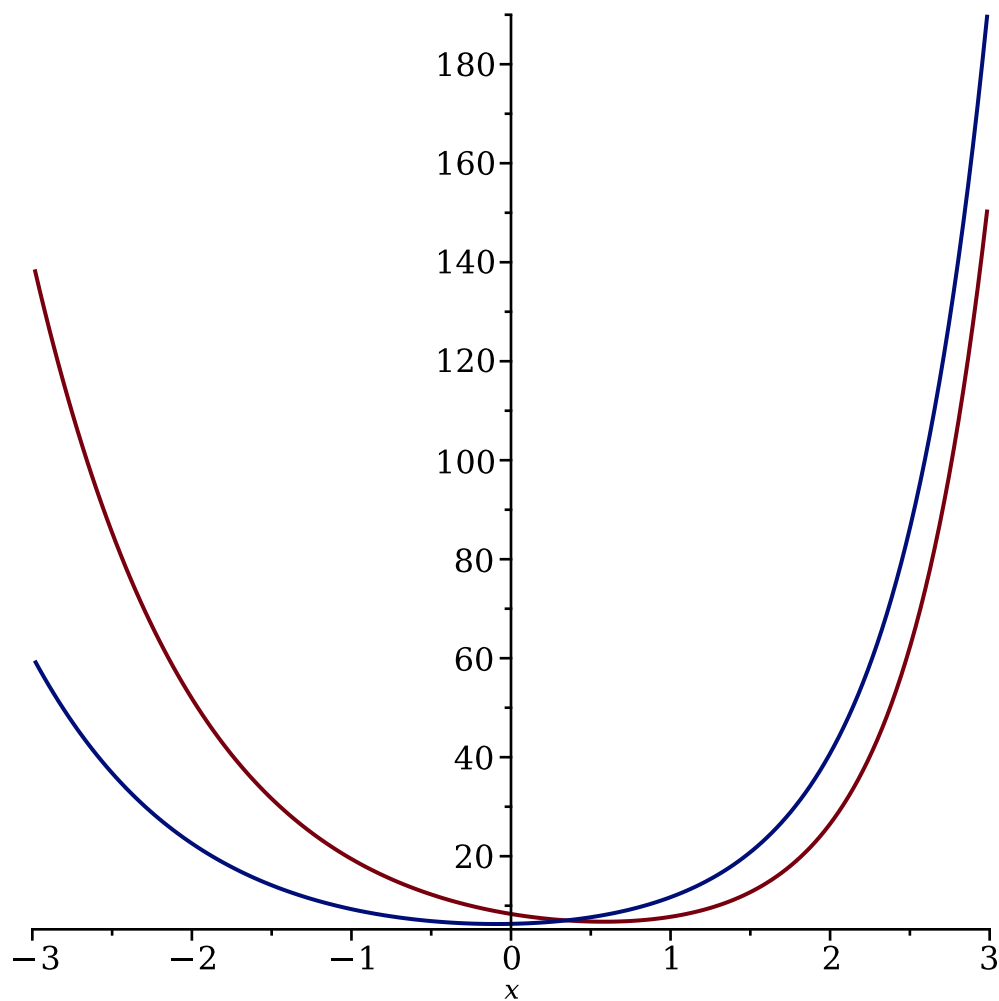
```
> sol1:=dsolve(ecdif1,y(x));
```

$$sol1 := y(x) = e^{-x} c_2 + e^x c_1 + \frac{e^{2x}}{3} \quad (35)$$

```
> y1:=unapply(rhs(sol1),x,c__1,c__2)
```

$$y1 := (x, c_1, c_2) \mapsto e^{-x} \cdot c_2 + e^x \cdot c_1 + \frac{e^{2 \cdot x}}{3} \quad (36)$$

```
> plot([y1(x,1,7),y1(x,3,3)],x=-3..3)
```



```
> ecdif1:=diff(y(x),x,x)+4*y(x)=1/cos(2*x)
```

$$ecdif1 := \frac{d^2}{dx^2} y(x) + 4 y(x) = \frac{1}{\cos(2 x)} \quad (37)$$

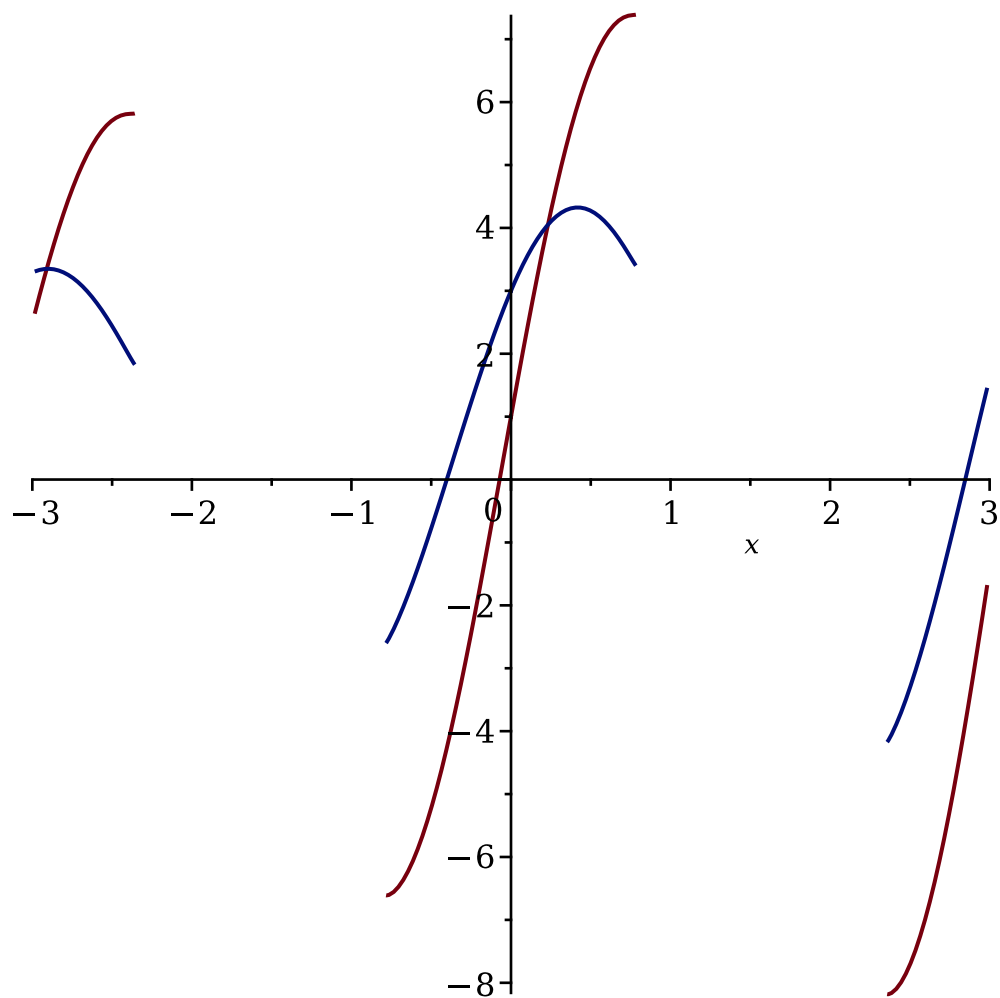
```
> sol1:=dsolve(ecdif1,y(x));
```

$$sol1 := y(x) = \sin(2 x) c_2 + \cos(2 x) c_1 + \frac{x \sin(2 x)}{2} + \frac{\ln(\cos(2 x)) \cos(2 x)}{4} \quad (38)$$

```
> y1:=unapply(rhs(sol1),x,c__1,c__2)
```

$$y1 := (x, c_1, c_2) \mapsto \sin(2 \cdot x) \cdot c_2 + \cos(2 \cdot x) \cdot c_1 + \frac{x \cdot \sin(2 \cdot x)}{2} + \frac{\ln(\cos(2 \cdot x)) \cdot \cos(2 \cdot x)}{4} \quad (39)$$

```
> plot([y1(x,1,7),y1(x,3,3)],x=-3..3)
```



```
> ecdif1:=diff(y(x),x$2)-y(x)=1/(1+exp(x))
```

$$ecdif1 := \frac{d^2}{dx^2} y(x) - y(x) = \frac{1}{1 + e^x} \quad (40)$$

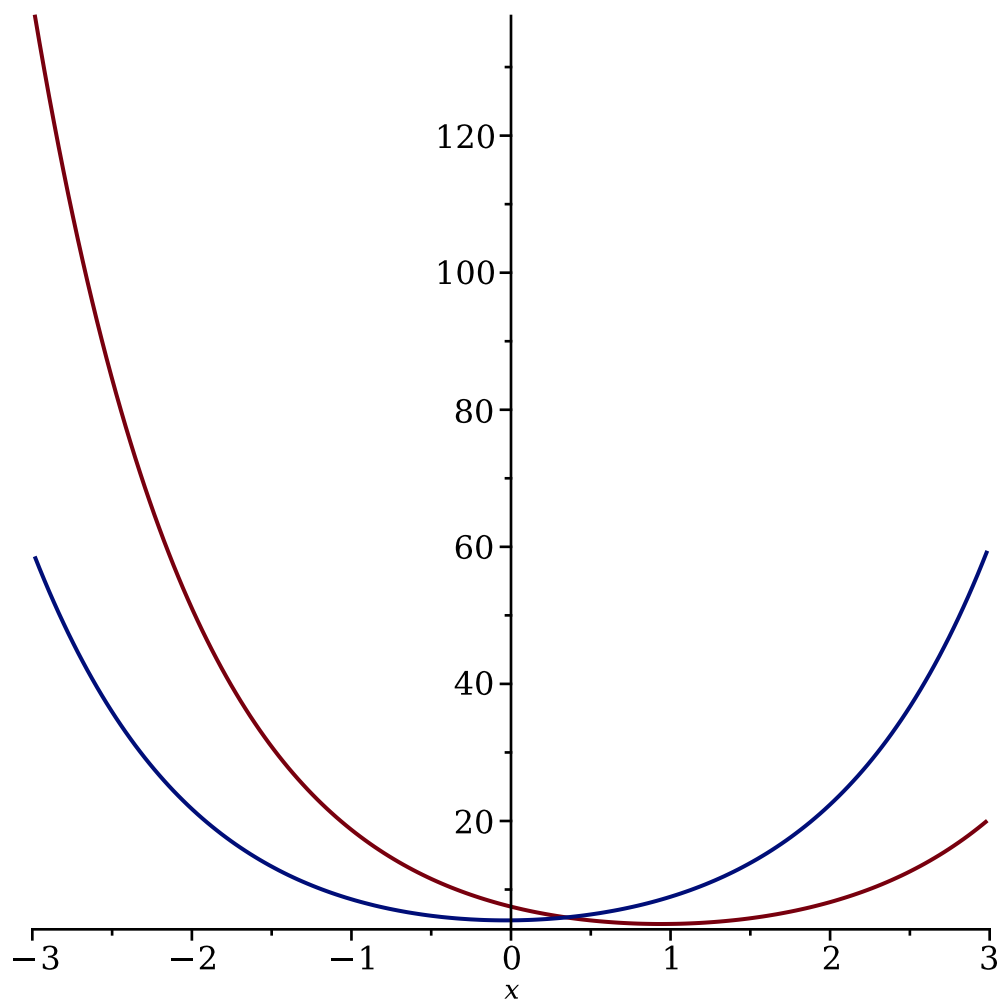
```
> sol1:=dsolve(ecdif1,y(x));
```

$$sol1 := y(x) = e^{-x} c_2 + e^x c_1 + \frac{(e^x - e^{-x}) \ln(1 + e^x)}{2} - \frac{\ln(e^x) e^x}{2} - \frac{1}{2} \quad (41)$$

```
> y1:=unapply(rhs(sol1),x,c__1,c__2)
```

$$y1 := (x, c_1, c_2) \mapsto e^{-x} \cdot c_2 + e^x \cdot c_1 + \frac{(e^x - e^{-x}) \cdot \ln(1 + e^x)}{2} - \frac{\ln(e^x) \cdot e^x}{2} - \frac{1}{2} \quad (42)$$

```
> plot([y1(x,1,7),y1(x,3,3)],x=-3..3)
```



```
> ecdif2:=diff(y(x),x)=1+y(x)^2
```

$$ecdif2 := \frac{d}{dx} y(x) = 1 + y(x)^2 \quad (43)$$

```
> con2:=y(0)=1
```

$$con2 := y(0) = 1 \quad (44)$$

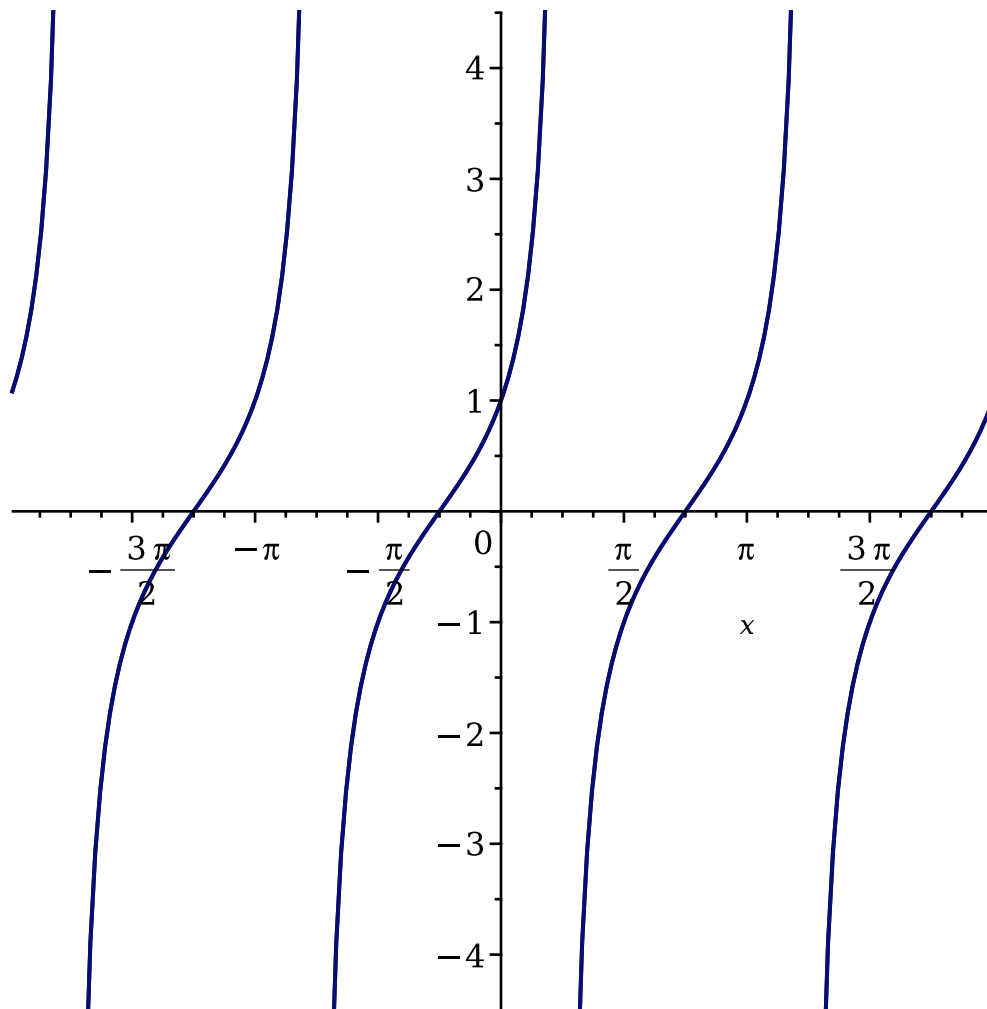
```
> sol2:=dsolve({ecdif2,con2},y(x))
```

$$sol2 := y(x) = \tan\left(x + \frac{\pi}{4}\right) \quad (45)$$

```
> y2:=unapply(rhs(sol2),x)
```

$$y2 := x \mapsto \tan\left(x + \frac{\pi}{4}\right) \quad (46)$$

```
> plot([y2(x),y2(x)])
```



> **ecdif2:=diff(y(x),x)=y(x)/(1-x^2)+1+x**

$$ecdif2 := \frac{d}{dx} y(x) = \frac{y(x)}{-x^2 + 1} + 1 + x \quad (47)$$

> **con2:=y(0)=0**

$$con2 := y(0) = 0 \quad (48)$$

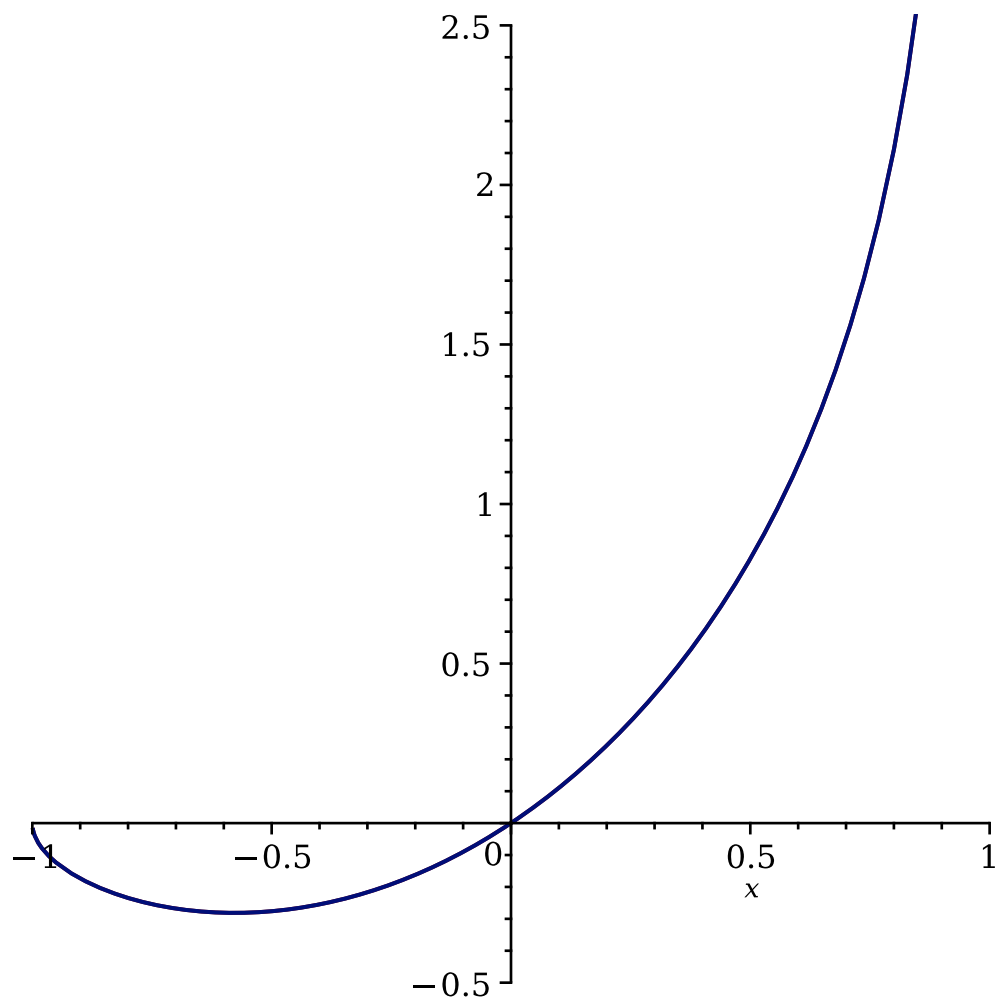
> **sol2:=dsolve({ecdif2,con2},y(x))**

$$sol2 := y(x) = \frac{(x \sqrt{-x^2 + 1} + \arcsin(x)) (x + 1)}{2 \sqrt{-x^2 + 1}} \quad (49)$$

> **y2:=unapply(rhs(sol2),x)**

$$y2 := x \mapsto \frac{(x \sqrt{-x^2 + 1} + \arcsin(x)) \cdot (x + 1)}{2 \sqrt{-x^2 + 1}} \quad (50)$$

> **plot([y2(x),y2(x)],x=-3..3)**



```
> ecdif2:=diff(y(x),x)-2*y(x)=-x^2
```

$$ecdif2 := \frac{d}{dx} y(x) - 2 y(x) = -x^2 \quad (51)$$

```
> con2:=y(0)=1/4
```

$$con2 := y(0) = \frac{1}{4} \quad (52)$$

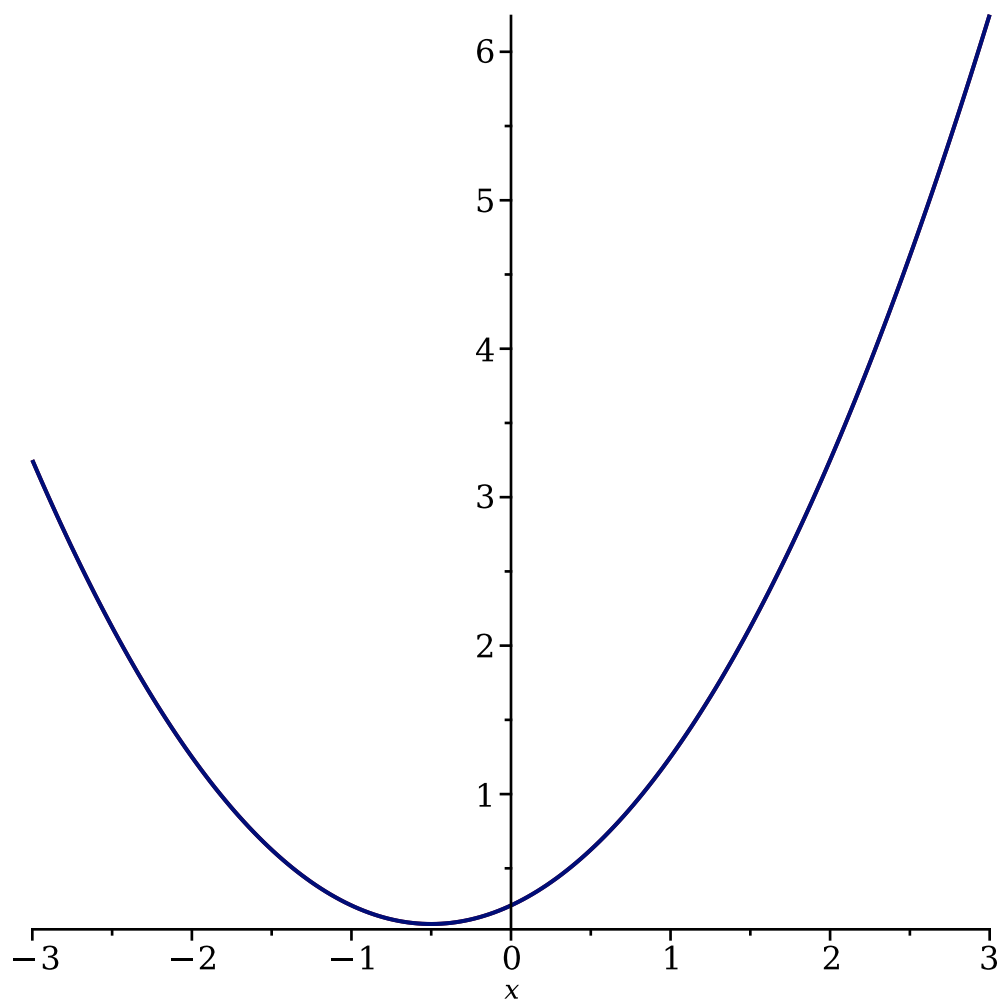
```
> sol2:=dsolve({ecdif2,con2},y(x))
```

$$sol2 := y(x) = \frac{1}{2} x^2 + \frac{1}{2} x + \frac{1}{4} \quad (53)$$

```
> y2:=unapply(rhs(sol2),x)
```

$$y2 := x \mapsto \frac{1}{2} \cdot x^2 + \frac{1}{2} \cdot x + \frac{1}{4} \quad (54)$$

```
> plot([y2(x),y2(x)],x=-3..3)
```



```
> ecdif2:=diff(y(x),x$2)-5*diff(y(x),x)+4*y(x)=0
```

$$ecdif2 := \frac{d^2}{dx^2} y(x) - 5 \frac{d}{dx} y(x) + 4 y(x) = 0 \quad (55)$$

```
> con2:=(y(0)=5,D(y)(0)=8)
```

$$con2 := y(0) = 5, D(y)(0) = 8 \quad (56)$$

```
> sol2:=dsolve({ecdif2,con2},y(x))
```

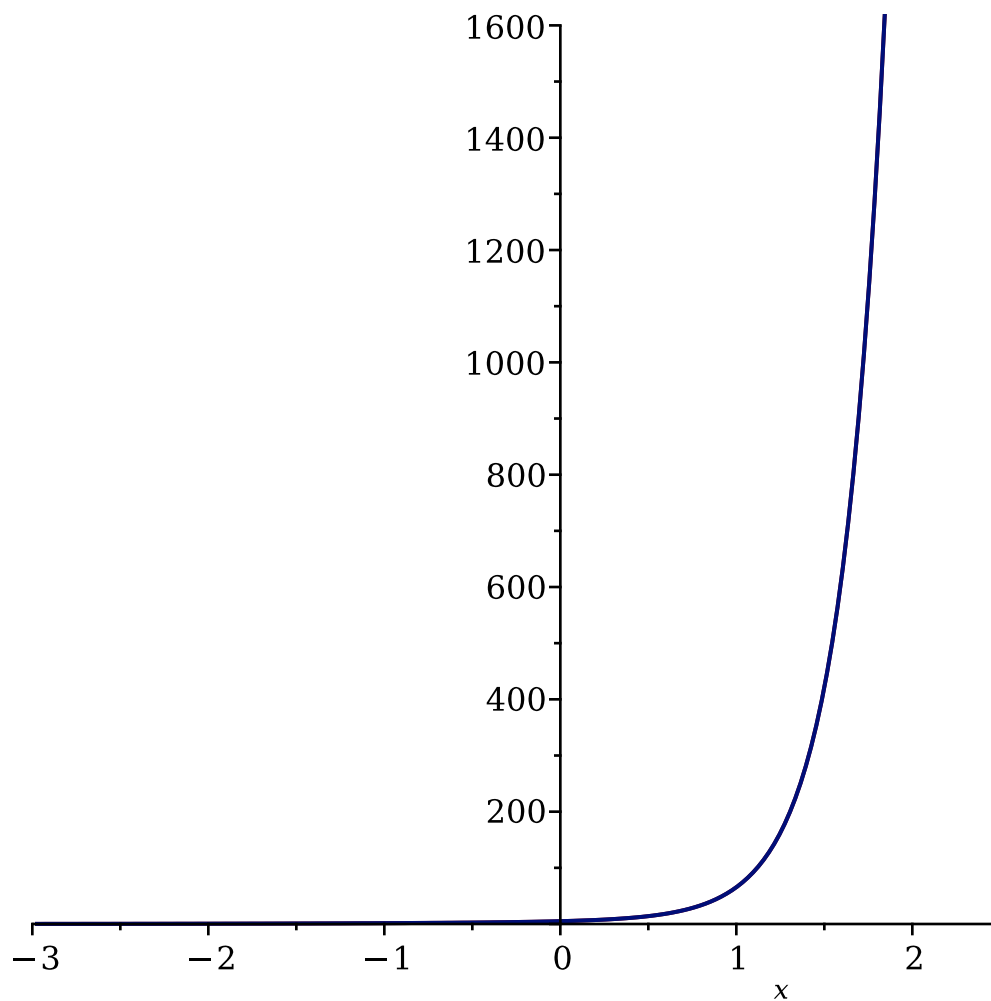
$$sol2 := y(x) = e^{4x} + 4e^x \quad (57)$$

```
> y2:=unapply(rhs(sol2),x)
```

$$y2 := x \mapsto e^{4 \cdot x} + 4 \cdot e^x \quad (58)$$

```
> plot([y2(x),y2(x)],x=-3..3)
```





```
> ecdif2:=diff(y(x),x$2)-4*diff(y(x),x)+5*y(x)=2*x^2*exp(x)
```

$$ecdif2 := \frac{d^2}{dx^2} y(x) - 4 \frac{d}{dx} y(x) + 5 y(x) = 2 x^2 e^x \quad (59)$$

```
> con2:=(y(0)=2,D(y)(0)=3)
```

$$con2 := y(0) = 2, D(y)(0) = 3 \quad (60)$$

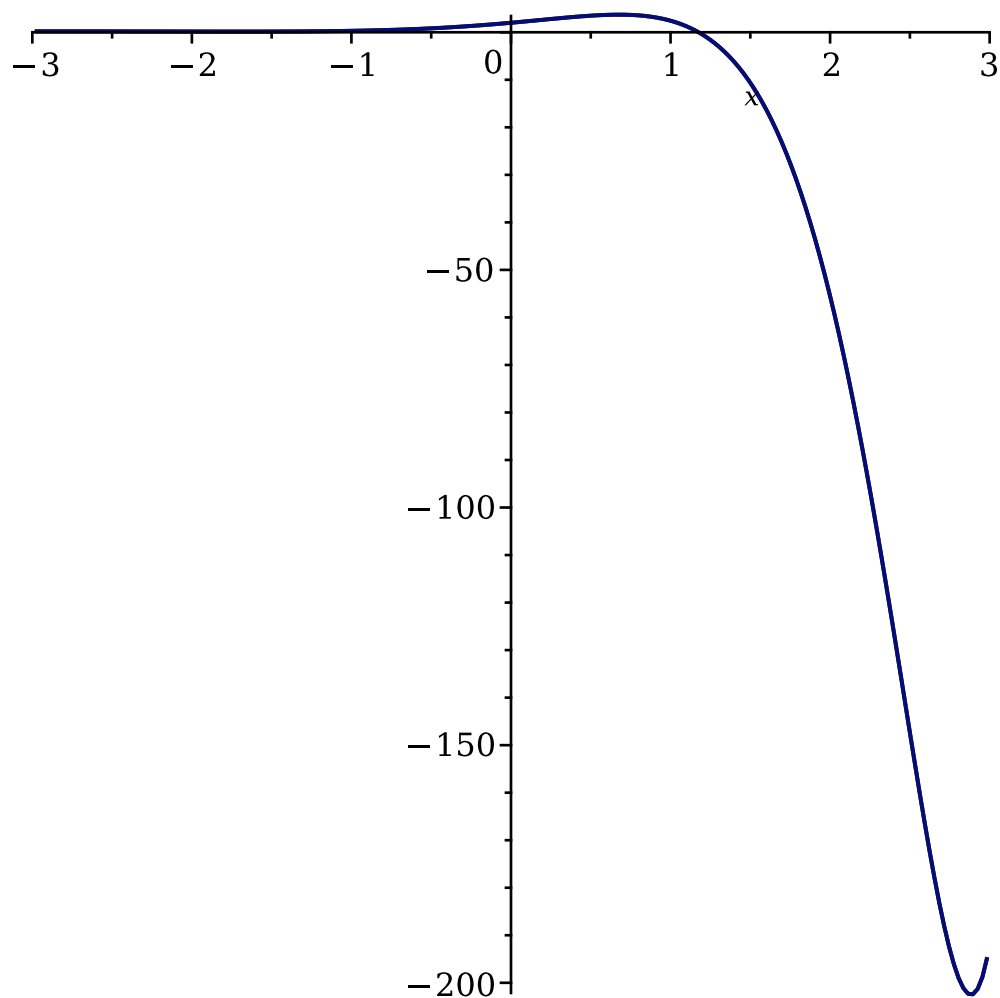
```
> sol2:=dsolve({ecdif2,con2},y(x))
```

$$sol2 := y(x) = (-2 \sin(x) + \cos(x)) e^{2x} + (x+1)^2 e^x \quad (61)$$

```
> y2:=unapply(rhs(sol2),x)
```

$$y2 := x \mapsto (-2 \cdot \sin(x) + \cos(x)) \cdot e^{2 \cdot x} + (x+1)^2 \cdot e^x \quad (62)$$

```
> plot([y2(x),y2(x)],x=-3..3)
```



```
> ecdif2:=diff(y(x),x$2)+4*y(x)=4*(sin(2*x)+cos(2*x))
```

$$ecdif2 := \frac{d^2}{dx^2} y(x) + 4 y(x) = 4 \sin(2 x) + 4 \cos(2 x) \quad (63)$$

```
> con2:=(y(Pi)=2*Pi,D(y)(Pi)=2*Pi)
```

$$con2 := y(\pi) = 2 \pi, D(y)(\pi) = 2 \pi \quad (64)$$

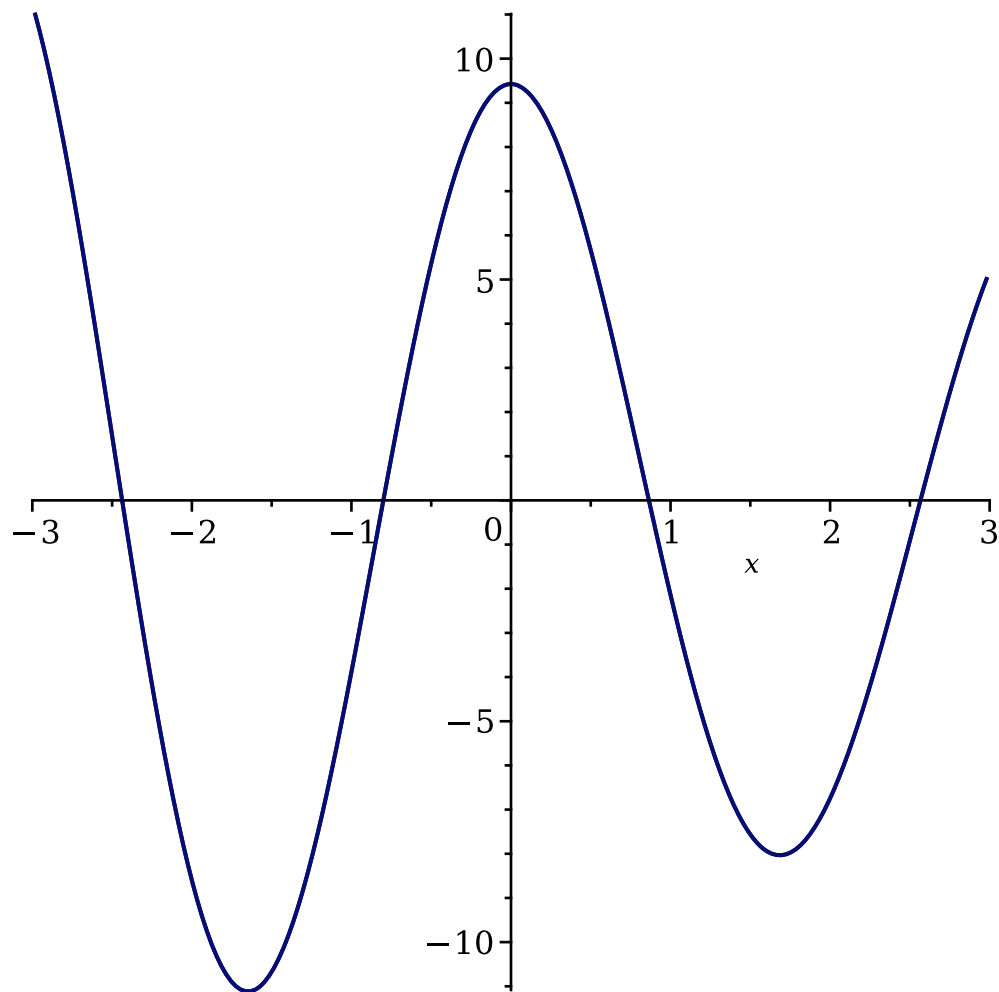
```
> sol2:=dsolve({ecdif2,con2},y(x))
```

$$sol2 := y(x) = (-x + 3 \pi) \cos(2 x) + \frac{\sin(2 x) (2 x + 1)}{2} \quad (65)$$

```
> y2:=unapply(rhs(sol2),x)
```

$$y2 := x \mapsto (-x + 3 \cdot \pi) \cdot \cos(2 \cdot x) + \frac{\sin(2 \cdot x) \cdot (2 \cdot x + 1)}{2} \quad (66)$$

```
> plot([y2(x),y2(x)],x=-3..3)
```



**> restart;with(DEtools); with(plots)**

[AreSimilar, Closure, DENormal, DEplot, DEplot3d, DEplot\_polygon, DFactor, DFactorLCLM, 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, 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, hypergeometricsols, hypergeomsols, hyperode, indicialeq, infgen, initialdata, integrate\_sols, intfactor, invariants, kovacicols, 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, righdivision, rtaylor, separablesol, singularities, solve\_group, super\_reduce, symgen, symmetric\_power, symmetric\_product, symtest, transinv, translate, untranslate, varparam, zoom]*

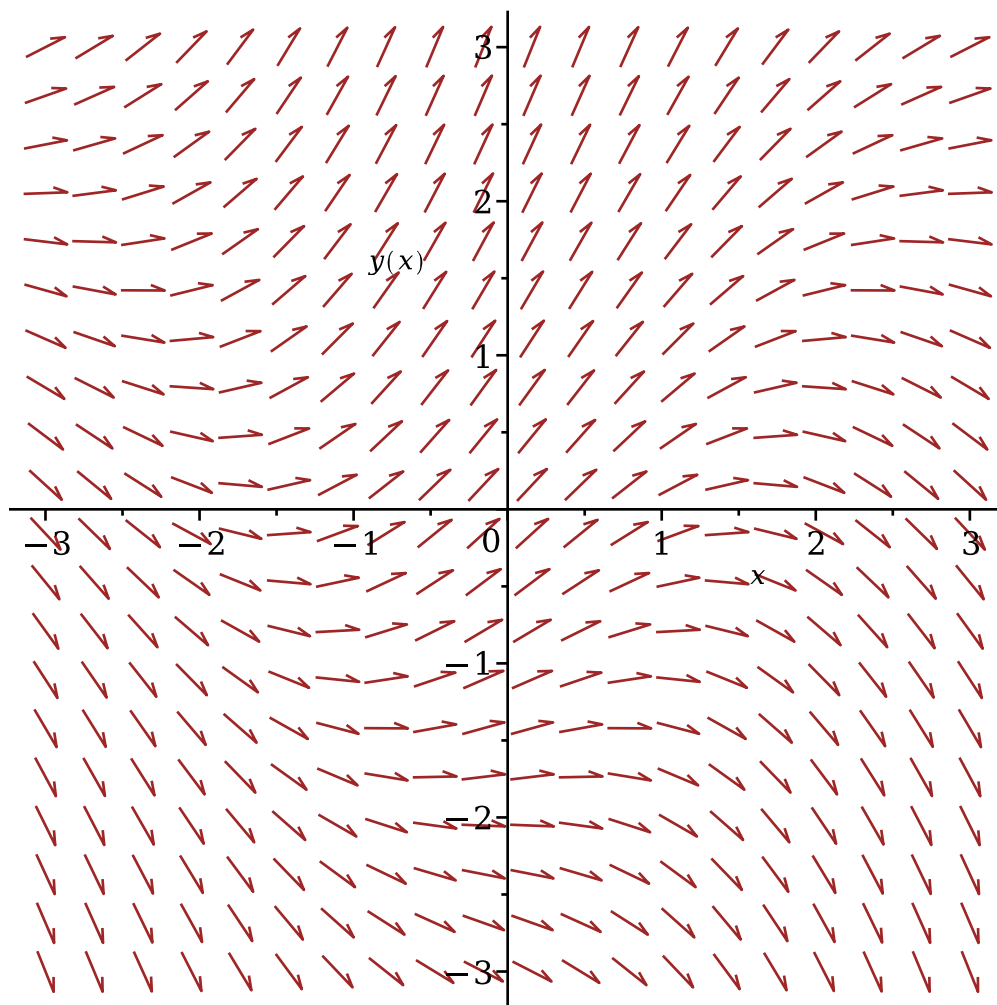
*[animate, animate3d, animatecurve, arrow, changecoords, complexplot, complexplot3d, conformal, conformal3d, contourplot, contourplot3d, coordplot, coordplot3d, densityplot, display, dualaxisplot, fieldplot, fieldplot3d, gradplot, gradplot3d, implicitplot, implicitplot3d, inequal, interactive, interactiveparams, 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]* **(67)**

**> ecdif3:=diff(y(x),x)-y(x)/2=cos(x)**

$$ecdif3 := \frac{d}{dx} y(x) - \frac{y(x)}{2} = \cos(x)$$

**(68)**

**> DEplot(ecdif3,y(x),x=-3..3,y=-3..3)**



```
> con3:=y(0)=a
```

$$con3 := y(0) = a$$

(69)

```
> sol3:=dsolve({ecdif3,con3},y(x))
```

$$sol3 := y(x) = -\frac{2 \cos(x)}{5} + \frac{4 \sin(x)}{5} + e^{\frac{x}{2}} \left( a + \frac{2}{5} \right)$$

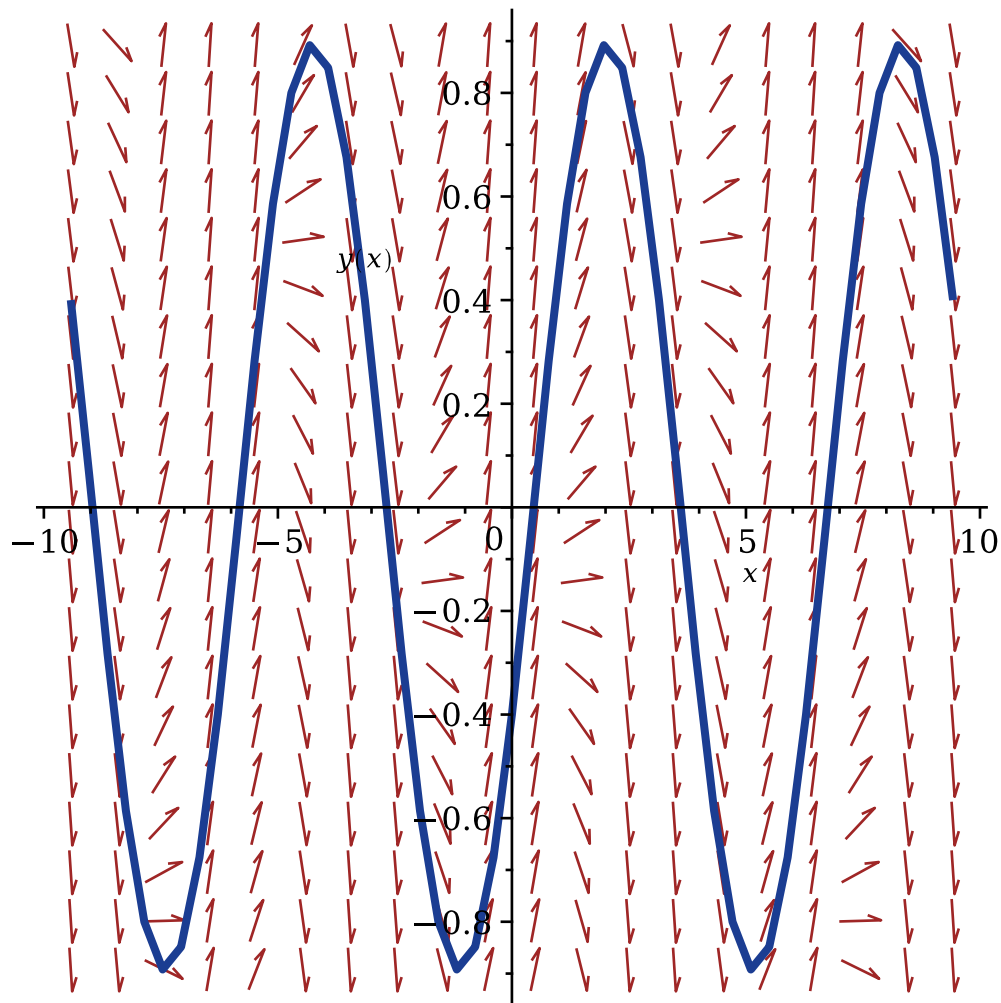
(70)

```
> a:=-2/5
```

$$a := -\frac{2}{5}$$

(71)

```
> DEplot(ecdif3,y(x),x=-3*Pi..3*Pi,[[con3]])
```



**> restart:with(DEtools); with(plots)**

[AreSimilar, Closure, DENormal, DEplot, DEplot3d, DEplot\_polygon, DFactor, DFactorLCLM, 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, 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, hypergeometricsols, hypergeomsols, hyperode, indicialeq, infgen, initialdata, integrate\_sols, intfactor, invariants, kovacicols, 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, righdivision, rtaylor, separablesol, singularities, solve\_group, super\_reduce, symgen, symmetric\_power, symmetric\_product, symtest, transinv, translate, untranslate, varparam, zoom]*

*[animate, animate3d, animatecurve, arrow, changecoords, complexplot, complexplot3d, conformal, 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]* (72)

**> ecdf4:=diff(y(x),x)=a\*y(x)+b**  

$$ecdf4 := \frac{d}{dx} y(x) = a y(x) + b$$
 (73)

**> sol4:=dsolve(ecdf4,y(x))**  

$$sol4 := y(x) = -\frac{b}{a} + e^{ax} c_1$$
 (74)

**> con4:=(y(0)=m)**  

$$con4 := y(0) = m$$
 (75)

**> sol4:=dsolve({ecdf4,con4},y(x))**  

$$sol4 := y(x) = \frac{(m a + b) e^{ax} - b}{a}$$
 (76)

**> m=-b/a**  

$$m = -\frac{b}{a}$$
 (77)

**> con4:=(y(0)=-b/a)**  

$$con4 := y(0) = -\frac{b}{a}$$
 (78)

**> sol4:=dsolve({ecdf4,con4},y(x))**  
(79)

$$\text{sol4} := y(x) = -\frac{b}{a} \quad (79)$$

**> con4:=(y(0)=1)**

$$\text{con4} := y(0) = 1 \quad (80)$$

**> sol4:=dsolve({ecdif4,con4},y(x))**

$$\text{sol4} := y(x) = \frac{e^{ax}(a+b)-b}{a} \quad (81)$$

**> a=1**

$$a = 1 \quad (82)$$

**> b=1**

$$b = 1 \quad (83)$$

**> restart:with(DEtools); with(plots)**

[AreSimilar, Closure, DENormal, DEplot, DEplot3d, DEplot\_polygon, DFactor, DFactorLCLM, 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, 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, hypergeometricsols, hypergeomsols, hyperode, indicialeq, infgen, initialdata, integrate\_sols, intfactor, invariants, kovacicols, 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]

[animate, animate3d, animatecurve, arrow, changecoords, complexplot, (84)



*complexplot3d, conformal, 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]*

**> ecdif5:=diff(y(x),x\$2)-diff(y(x),x)-2\*y(x)=0**

$$ecdif5 := \frac{d^2}{dx^2} y(x) - \frac{d}{dx} y(x) - 2 y(x) = 0 \quad (85)$$

**> con5:=(D(y)(0)=2, y(0)=a)**

$$con5 := D(y)(0) = 2, y(0) = a \quad (86)$$

**> sol5:=dsolve({ecdif5,con5},y(x))**

$$sol5 := y(x) = \frac{(-2 + 2a) e^{-x}}{3} + \frac{e^{2x} (a + 2)}{3} \quad (87)$$

**> a=-2**

$$a = -2 \quad (88)$$