

```

> dgl:=diff(y(x),x)=y(x);
          
$$dgl := \frac{\partial}{\partial x} y(x) = y(x)$$

> dgl;
          
$$\frac{\partial}{\partial x} y(x) = y(x)$$

> dgl:=D(y)(x)=y(x);
          
$$dgl := D(y)(x) = y(x)$$

> dgl;
          
$$D(y)(x) = y(x)$$

> dsolve(dgl);
          
$$y(x) = \_C1 e^x$$

> dsolve({dgl, y(0)=1}, y(x));
          
$$y(x) = e^x$$

> dgl:=diff(y(x),x)=y(x)-y(x)^2;
          
$$dgl := \frac{\partial}{\partial x} y(x) = y(x) - y(x)^2$$

> dgl;
          
$$\frac{\partial}{\partial x} y(x) = y(x) - y(x)^2$$

> dsolve(dgl);
          
$$y(x) = \frac{1}{1 + e^{(-x)} \_C1}$$

> dgl:=diff(y(x),x)=sin(x)*(y(x)+1);

```

$$dgl := \frac{\partial}{\partial x} y(x) = \sin(x) (y(x) + 1)$$

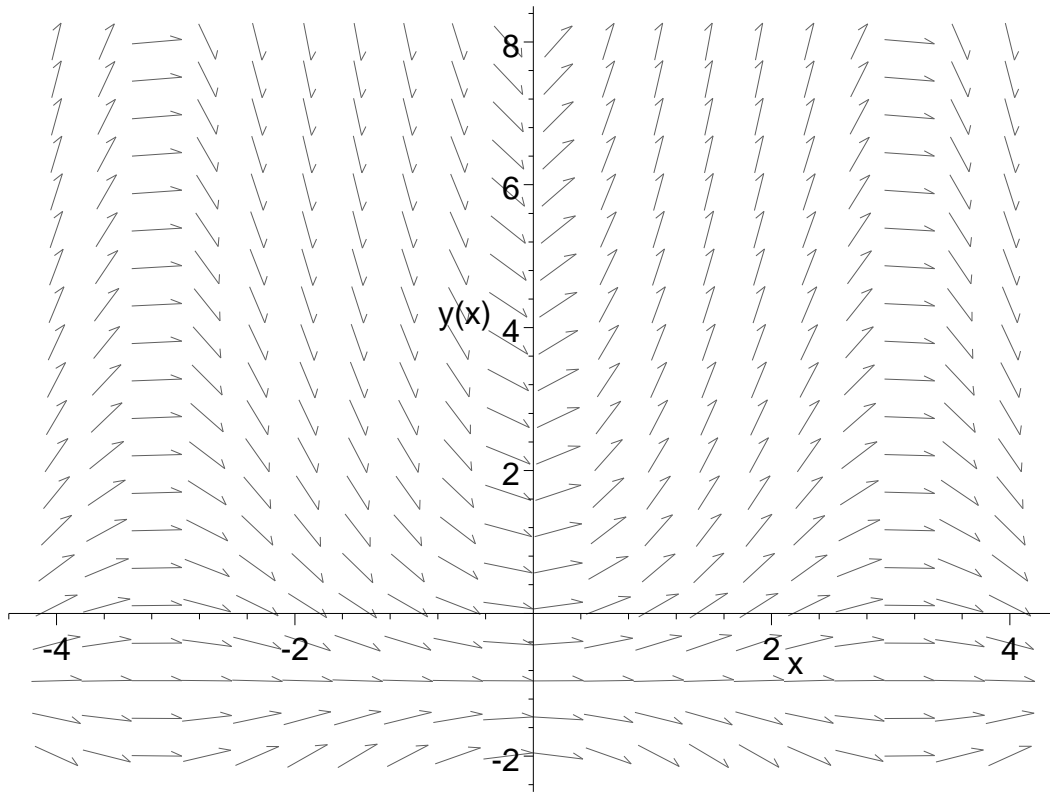
> dsolve (dgl) ;

$$y(x) = -1 + e^{(-\cos(x))} _C1$$

> with (DEtools) ;

[*DEnormal, DEplot, DEplot3d, DEplot_polygon, DFactor, Dchangevar, GCRD, LCLM, PDEchangecoords, RiemannPsols, abelsol, adjoint, autonomous, bernoullisol, buildsol, buildsym, canoni, chinisol, clairautsol, constcoeffsols, convertAlg, convertsys, dalembertsol, de2diffop, dfieldplot, diffop2de, eigenring, endomorphism_charpoly, equinv, eta_k, eulersols, exactsol, expsols, exterior_power, formal_sol, gen_exp, generate_ic, genhomosol, hamilton_eqs, indicialeq, infgen, integrate_sols, intfactor, kovacicols, leftdivision, liesol, line_int, linearsol, matrixDE, matrix_riccati, moser_reduce, mult, newton_polygon, odeadvisor, odepde, parametricsol, phaseportrait, poincare, polysols, ratsols, reduceOrder, regular_parts, regularsp, riccati_system, riccatisol, rightdivision, separablesol, super_reduce, symgen, symmetric_power, symmetric_product, symtest, transinv, translate, untranslate, varparam, zoom*]

> DEplot (dgl, y (x) , x=-4 . . 4 , y=-2 . . 8) ;



```
> p1:=DEplot(dg1, y(x), x=-4..4, y=-2..8):
```

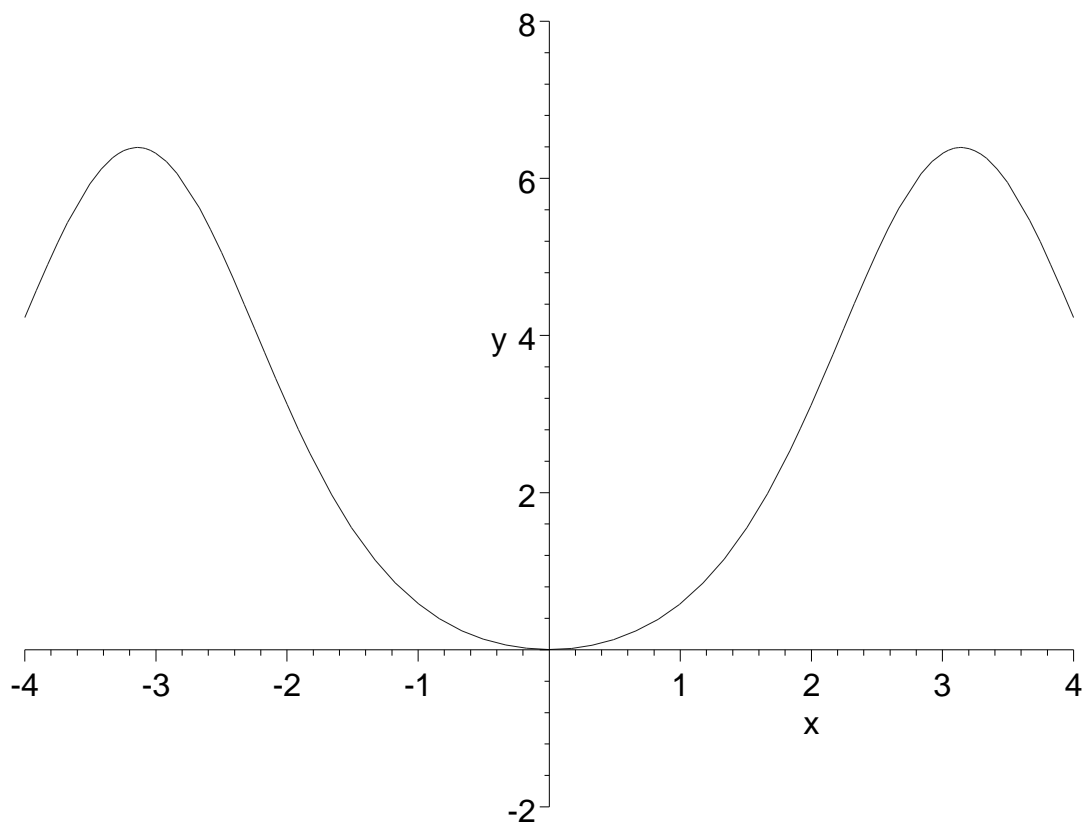
```
> dsolve({dg1, y(0)=0}, y(x));
```

$$y(x) = -1 + \frac{e^{(-\cos(x))}}{\cosh(1) - \sinh(1)}$$

```
> f:=rhs(%);
```

$$f := -1 + \frac{e^{(-\cos(x))}}{\cosh(1) - \sinh(1)}$$

```
> plot(f, x=-4..4, y=-2..8, color=blue);
```

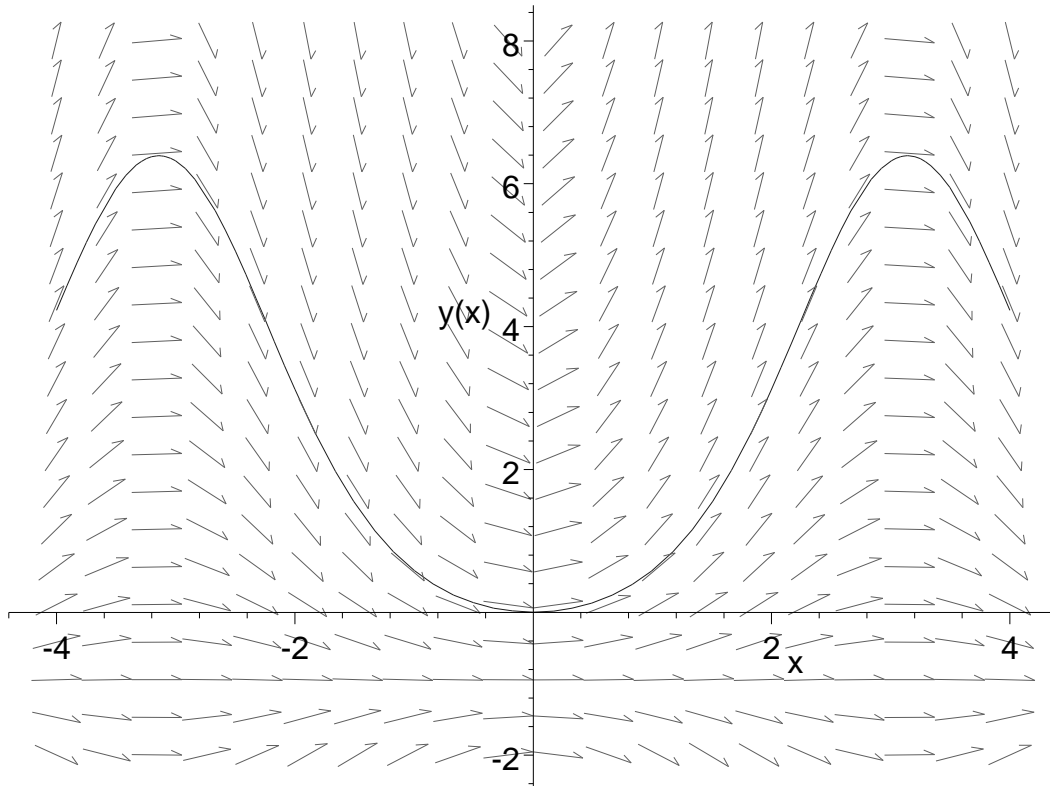


```
[ > p2:=plot (f, x=-4..4, y=-2..8, color=blue) :
> with (plots) ;
```

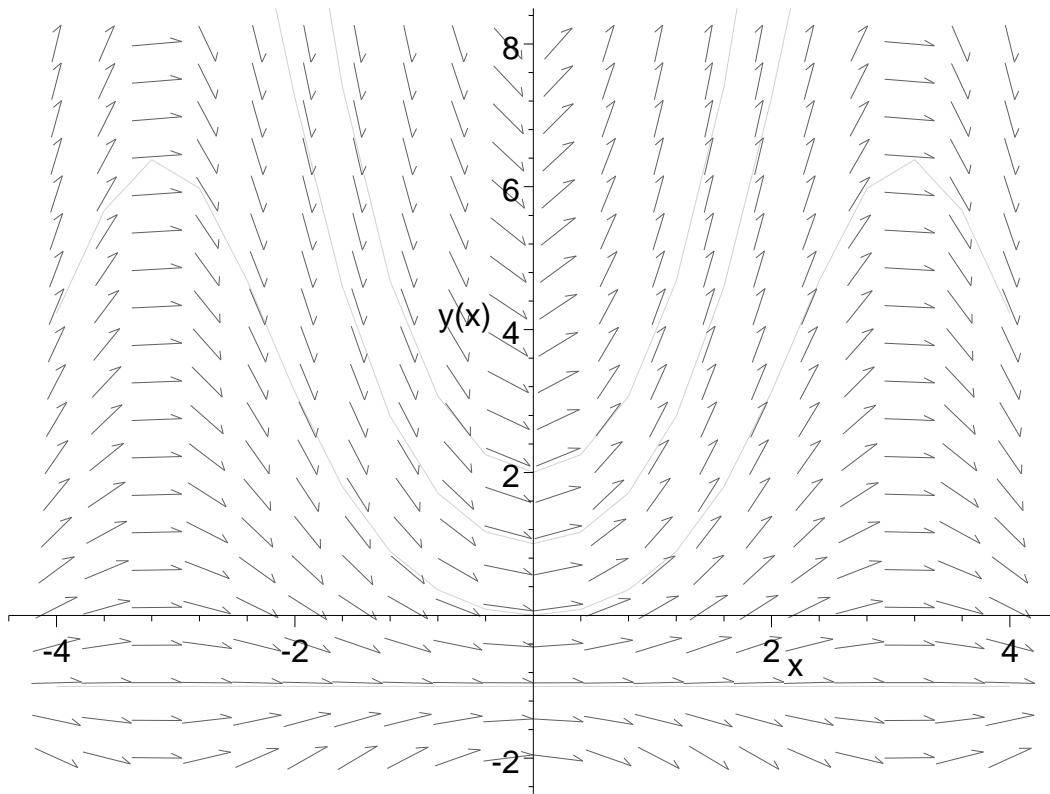
[*animate, animate3d, animatecurve, changecoords, complexplot, complexplot3d, conformal, contourplot, contourplot3d, coordplot, coordplot3d, cylinderplot, densityplot, display, display3d, fieldplot, fieldplot3d, gradplot, gradplot3d, implicitplot, implicitplot3d, inequal, listcontplot, listcontplot3d, listdensityplot, listplot, listplot3d, loglogplot, logplot, matrixplot, odeplot, pareto, pointplot, pointplot3d, polarplot, polygonplot, polygonplot3d, polyhedra_supported, polyhedraplot, replot, rootlocus,*

semilogplot, setoptions, setoptions3d, spacecurve,
sparsematrixplot, sphereplot, surfdata, textplot, textplot3d,
tubeplot]

```
> display({p1,p2});
```



```
> DEplot(dgl, y(x), x=-4..4, y=-2..8, [[y(0)=0], [y(0)=1], [y(0)=2], [y(2)=-1]]);
```



```
> dgl:=diff(h(t),t)=-2*sqrt(h(t));
```

$$dgl := \frac{\partial}{\partial t} h(t) = -2 \sqrt{h(t)}$$

```
> dsolve(dgl, h(t));
```

$$h(t) = t^2 - 2t_C1 + _C1^2$$

```
> dsolve({dgl, h(0)=1}, h(t));
```

$$h(t) = t^2 - 2t + 1, h(t) = t^2 + 2t + 1$$

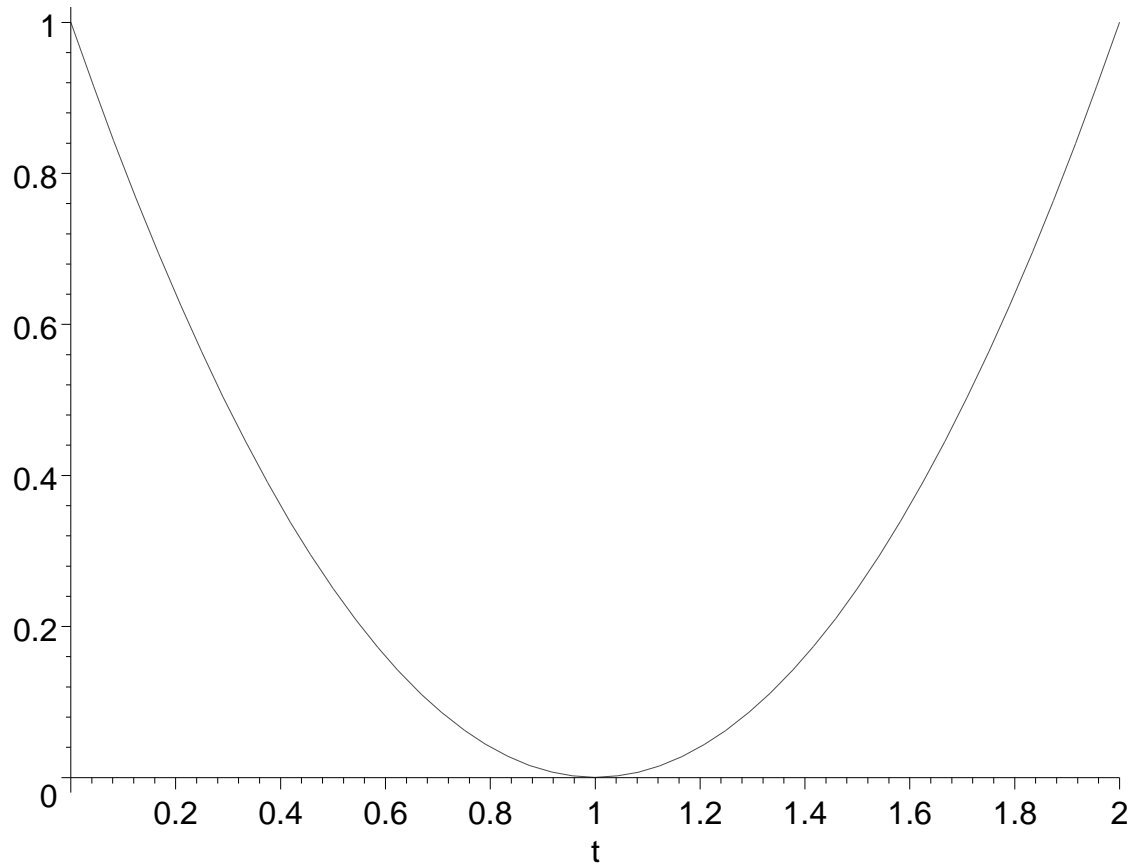
```
> allvalues(%[1]);
```

$$h(t) = t^2 - 2t + 1$$

```
> f:=rhs(%);
```

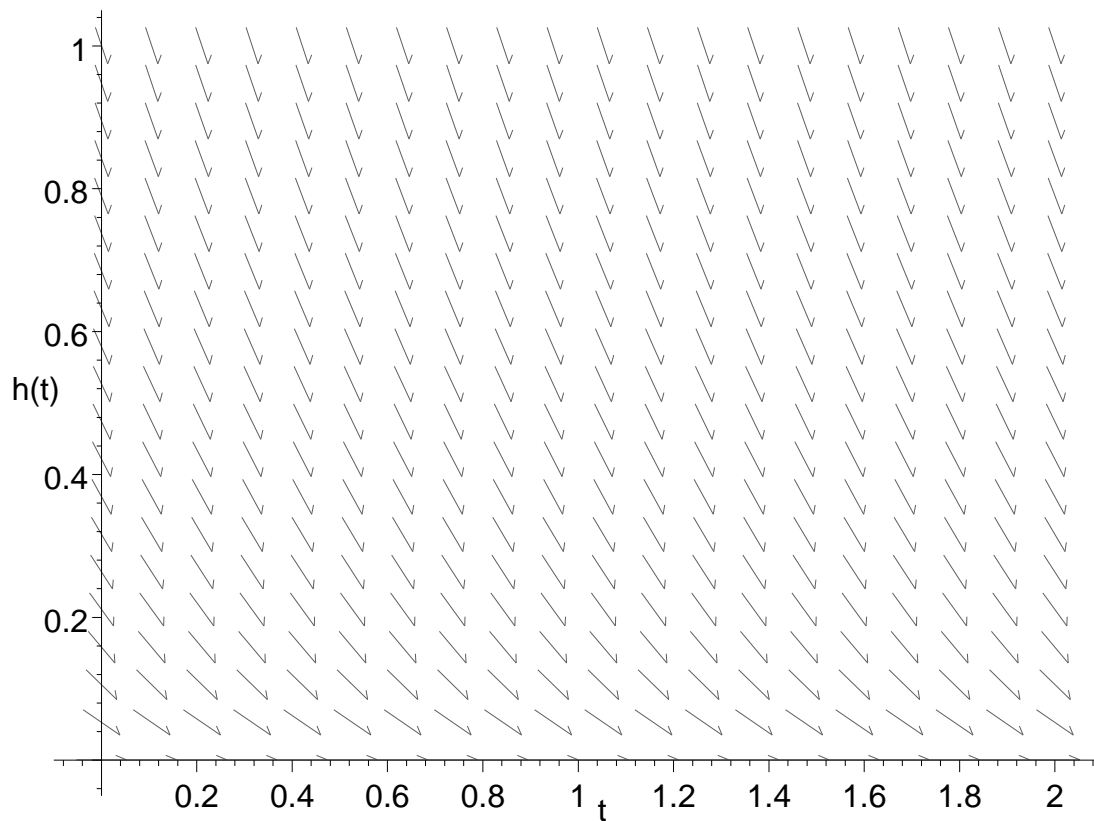
$$f := t^2 - 2t + 1$$

```
> plot (f, t=0..2);
```

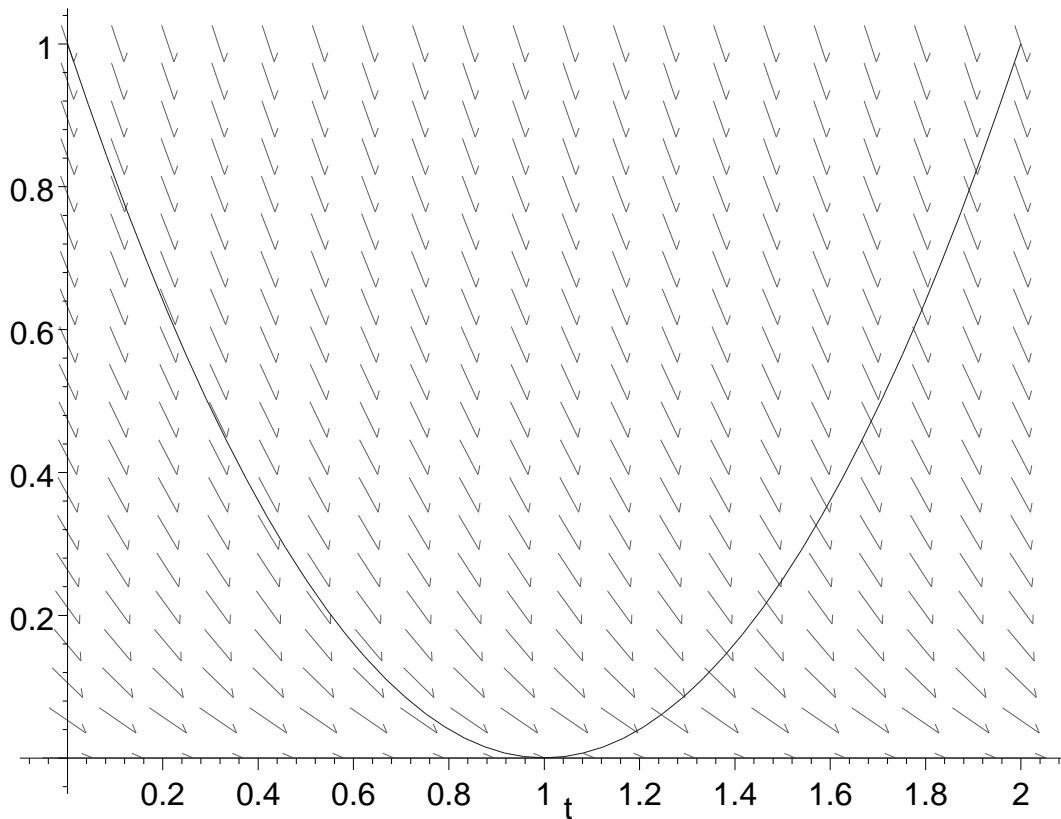


```
> p3:=plot (f, t=0..2, color=blue) :
```

```
> DEplot (dgl, h(t), t=0..2, h=0..1);
```



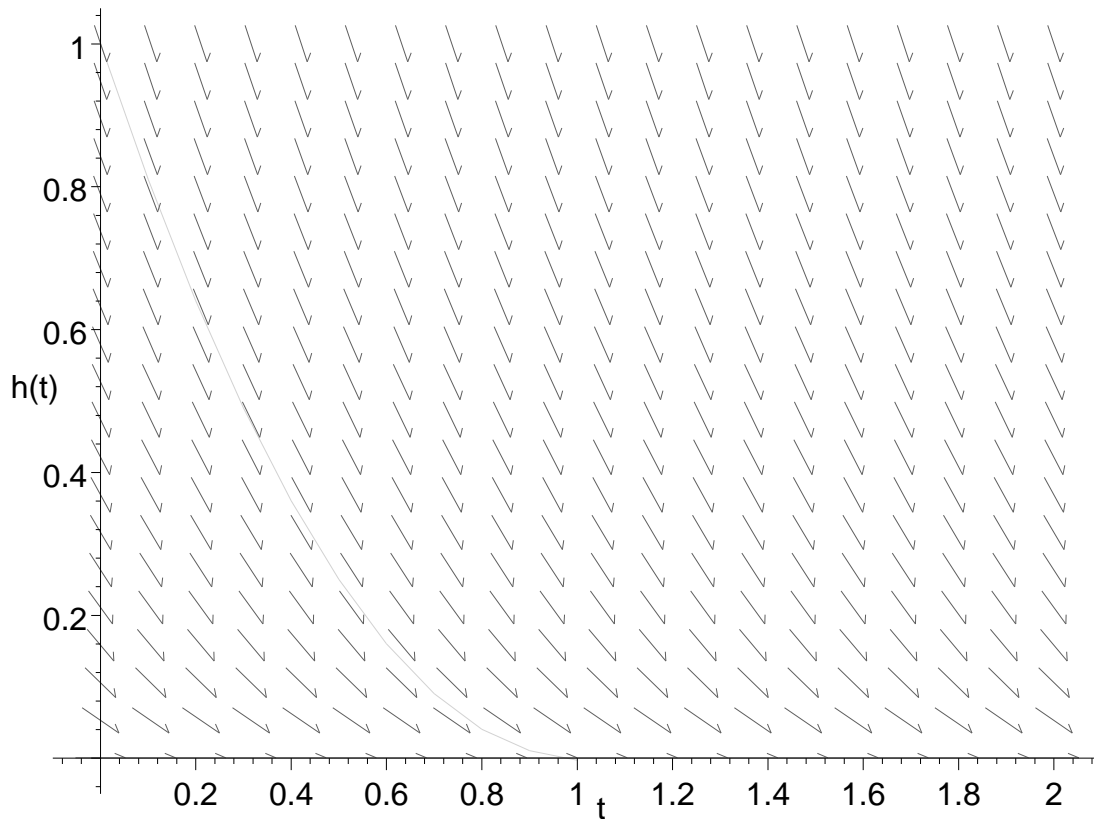
```
[ > p4:=DEplot (dgl, h(t), t=0..2, h=0..1) :  
> display ([p3, p4]) ;
```

```
> DEplot(dgl, h(t), t=0..2, h=0..1, [[h(0)=1]]);
Error, (in DEtools/DEplot/drawlines) Stopping
integration due to, sqrt of a negative number
> dgl:=diff(h(t), t)=-2*sqrt(abs(h(t)));
```

$$dgl := \frac{\partial}{\partial t} h(t) = -2 \sqrt{|h(t)|}$$

```
> DEplot(dgl, h(t), t=0..2, h=0..1, [[h(0)=1]]);
```



```
> dgl:=diff(x(t),t,t)+2*diff(x(t),t)+17*x(t)=0;
```

$$dgl := \left(\frac{\partial^2}{\partial t^2} x(t) \right) + 2 \left(\frac{\partial}{\partial t} x(t) \right) + 17 x(t) = 0$$

```
> dsolve(dgl, x(t));
```

$$x(t) = _C1 e^{(-t)} \cos(4 t) + _C2 e^{(-t)} \sin(4 t)$$

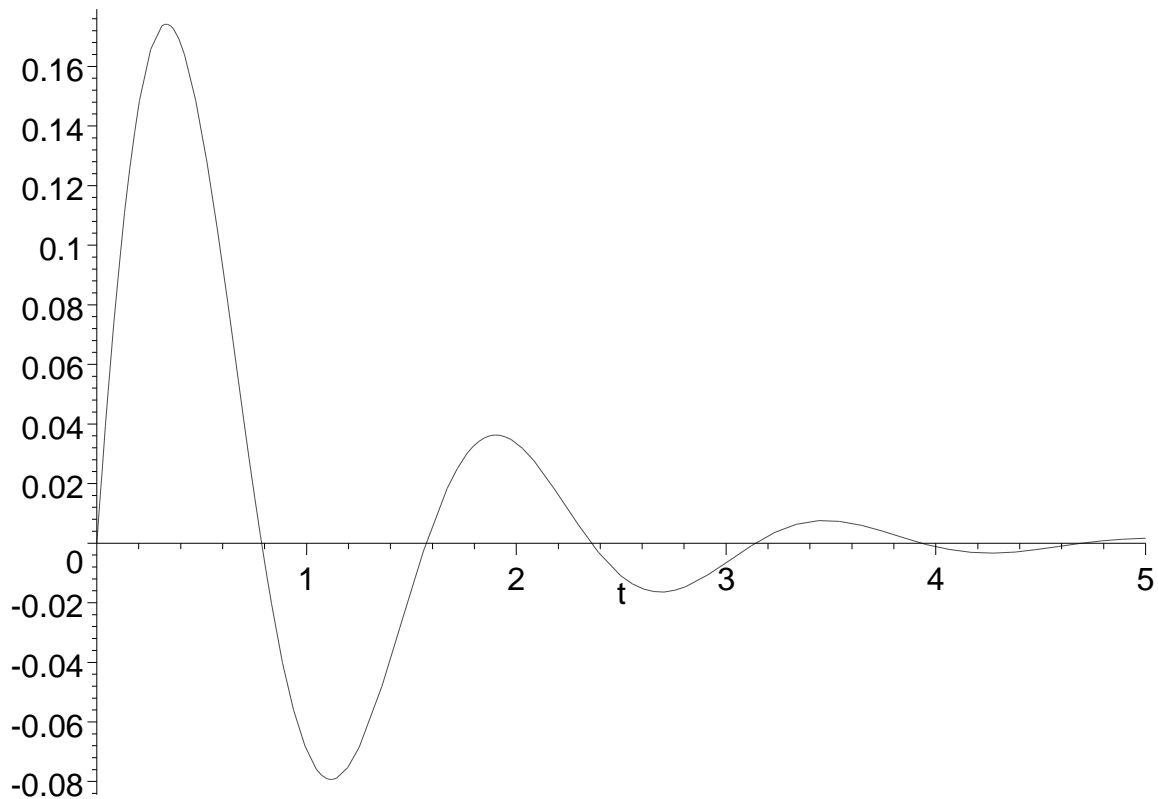
```
> dsolve({dgl, x(0)=0, D(x)(0)=1}, x(t));
```

$$x(t) = \frac{1}{4} e^{(-t)} \sin(4 t)$$

```
> f:=rhs(%);
```

$$f := \frac{1}{4} e^{(-t)} \sin(4 t)$$

```
> plot (f, t=0..5);
```



```
> dgl := diff (x (t) , t, t) + 2 * diff (x (t) , t) + 17 * x (t) =
cos (t) ;
```

$$dgl := \left(\frac{\partial^2}{\partial t^2} x(t) \right) + 2 \left(\frac{\partial}{\partial t} x(t) \right) + 17 x(t) = \cos(t)$$

```
> dsolve (dgl, x (t) ) ;
```

$$x(t) = \frac{5}{208} \cos(4 t) \cos(5 t) - \frac{1}{208} \cos(4 t) \sin(5 t)$$

$$\begin{aligned}
& + \frac{3}{80} \cos(4 t) \cos(3 t) - \frac{1}{80} \cos(4 t) \sin(3 t) + \frac{1}{13} \sin(4 t) \cos(t)^5 \\
& + \frac{5}{13} \sin(4 t) \cos(t)^4 \sin(t) - \frac{3}{65} \sin(4 t) \cos(t)^3 \\
& - \frac{9}{65} \sin(4 t) \cos(t)^2 \sin(t) - \frac{7}{520} \sin(4 t) \cos(t) \\
& - \frac{7}{520} \sin(4 t) \sin(t) + _C1 e^{(-t)} \cos(4 t) + _C2 e^{(-t)} \sin(4 t)
\end{aligned}$$

> dsolve({dgl, x(0)=0, D(x)(0)=1}, x(t));

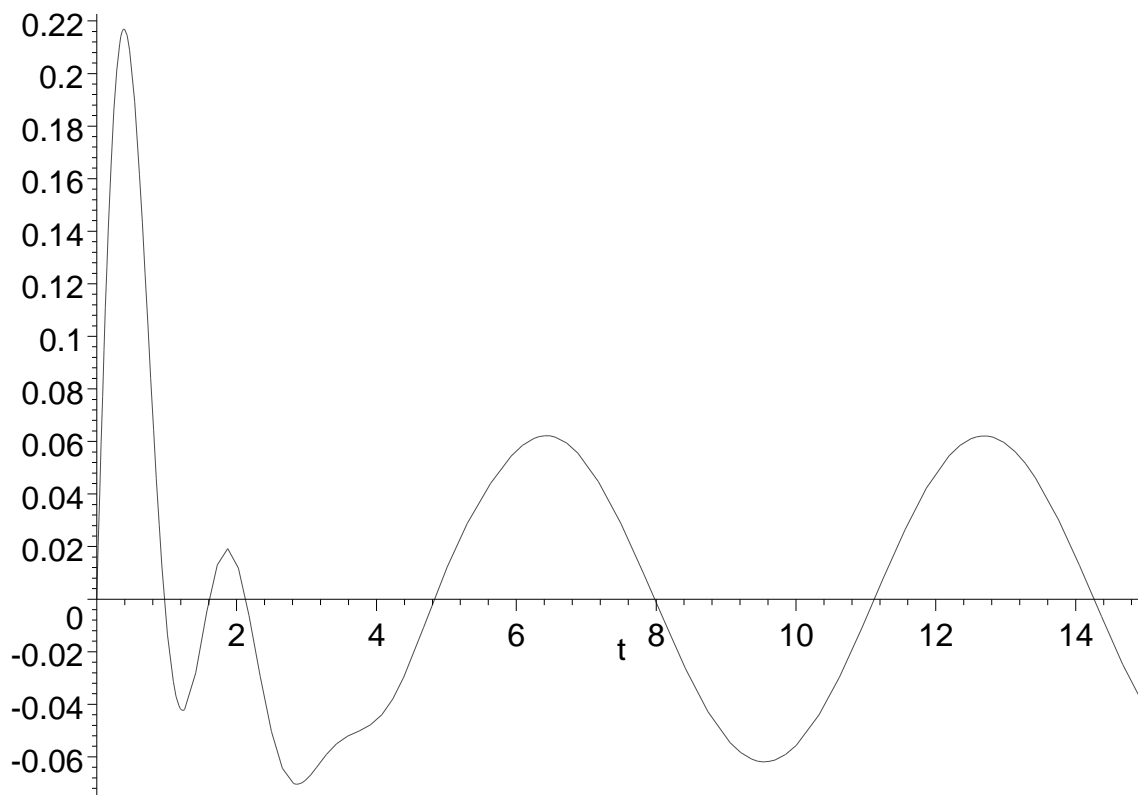
$$\begin{aligned}
x(t) = & \frac{5}{208} \cos(4 t) \cos(5 t) - \frac{1}{208} \cos(4 t) \sin(5 t) \\
& + \frac{3}{80} \cos(4 t) \cos(3 t) - \frac{1}{80} \cos(4 t) \sin(3 t) + \frac{1}{13} \sin(4 t) \cos(t)^5 \\
& + \frac{5}{13} \sin(4 t) \cos(t)^4 \sin(t) - \frac{3}{65} \sin(4 t) \cos(t)^3 \\
& - \frac{9}{65} \sin(4 t) \cos(t)^2 \sin(t) - \frac{7}{520} \sin(4 t) \cos(t) \\
& - \frac{7}{520} \sin(4 t) \sin(t) - \frac{4}{65} e^{(-t)} \cos(4 t) + \frac{121}{520} e^{(-t)} \sin(4 t)
\end{aligned}$$

> f:=rhs(%);

$$f := \frac{5}{208} \cos(4 t) \cos(5 t) - \frac{1}{208} \cos(4 t) \sin(5 t)$$

$$\begin{aligned}
& + \frac{3}{80} \cos(4t) \cos(3t) - \frac{1}{80} \cos(4t) \sin(3t) + \frac{1}{13} \sin(4t) \cos(t)^5 \\
& + \frac{5}{13} \sin(4t) \cos(t)^4 \sin(t) - \frac{3}{65} \sin(4t) \cos(t)^3 \\
& - \frac{9}{65} \sin(4t) \cos(t)^2 \sin(t) - \frac{7}{520} \sin(4t) \cos(t) \\
& - \frac{7}{520} \sin(4t) \sin(t) - \frac{4}{65} e^{(-t)} \cos(4t) + \frac{121}{520} e^{(-t)} \sin(4t)
\end{aligned}$$

```
> plot(f, t=0..15);
```



```
> dgl:=diff(x(t), t, t)=-sin(x(t));
```

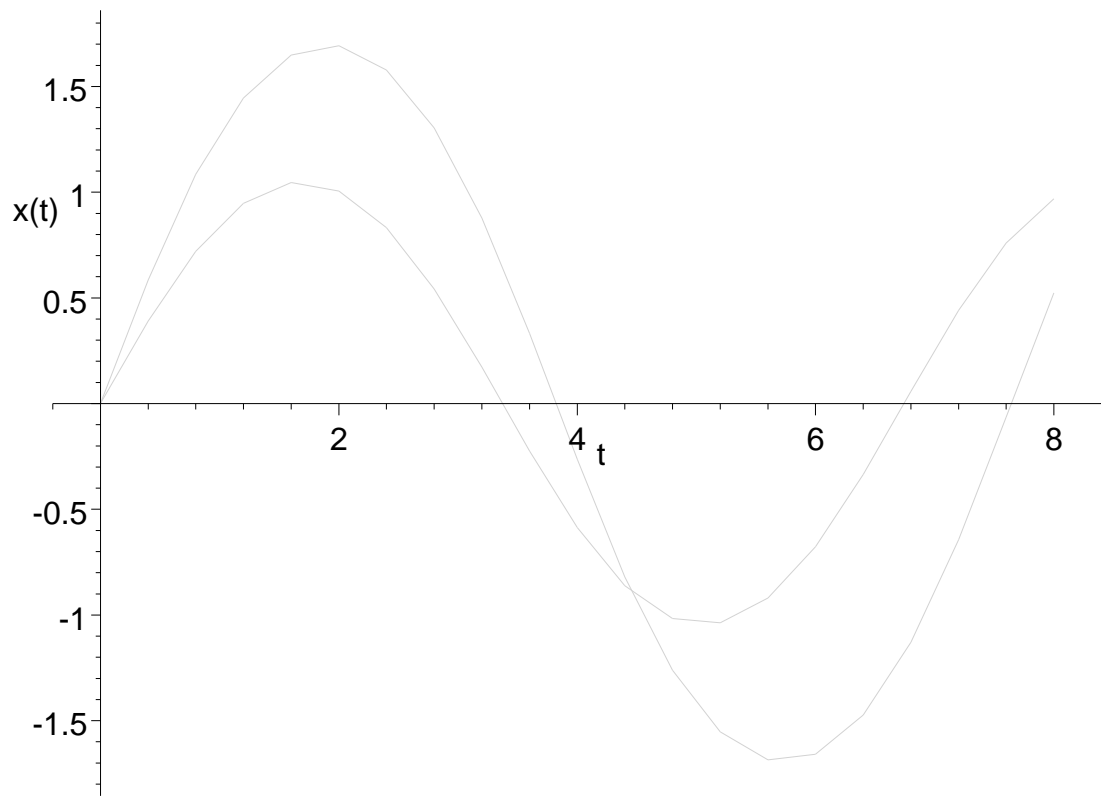
$$dgl := \frac{\partial^2}{\partial t^2} x(t) = -\sin(x(t))$$

> dsolve(dgl);

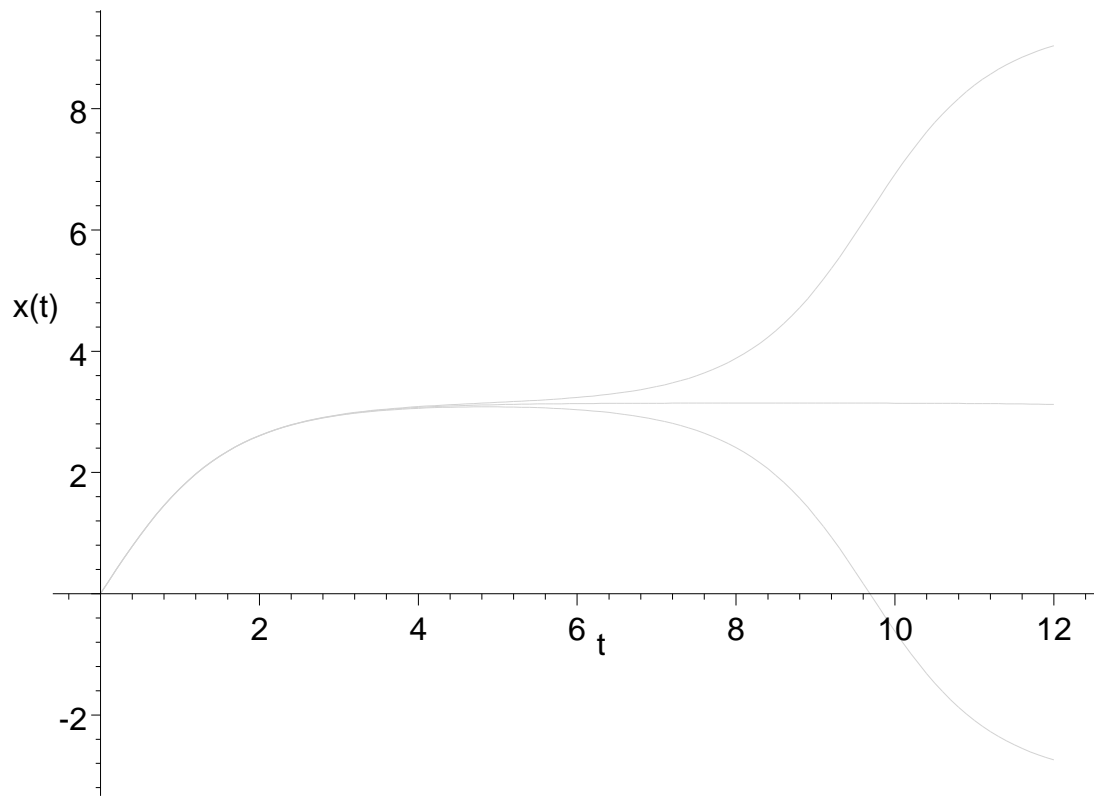
$$-\int^{\frac{x(t)}{2}} \frac{1}{\sqrt{2 \cos(a) + C1}} da - t - C2 = 0,$$

$$\int^{\frac{x(t)}{2}} \frac{1}{\sqrt{2 \cos(a) + C1}} da - t - C2 = 0$$

> DEplot(dgl, x(t), t=0..8, [[x(0)=0, D(x)(0)=1],
[x(0)=0, D(x)(0)=3/2]]);



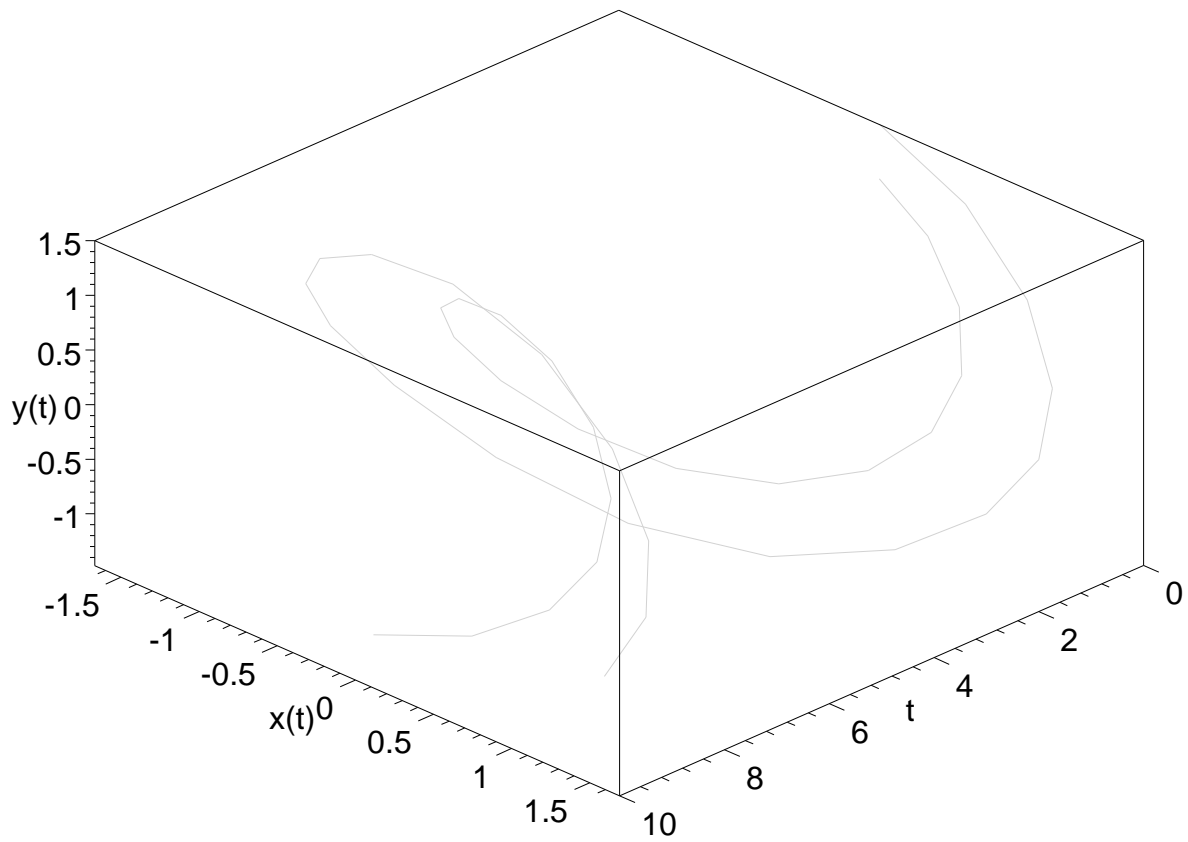
```
> DEplot(dgl, x(t), t=0..12, [[x(0)=0, D(x)(0)=1.999], [x(0)=0, D(x)(0)=2], [x(0)=0, D(x)(0)=2.001]], 'stepsize=0.1');
```



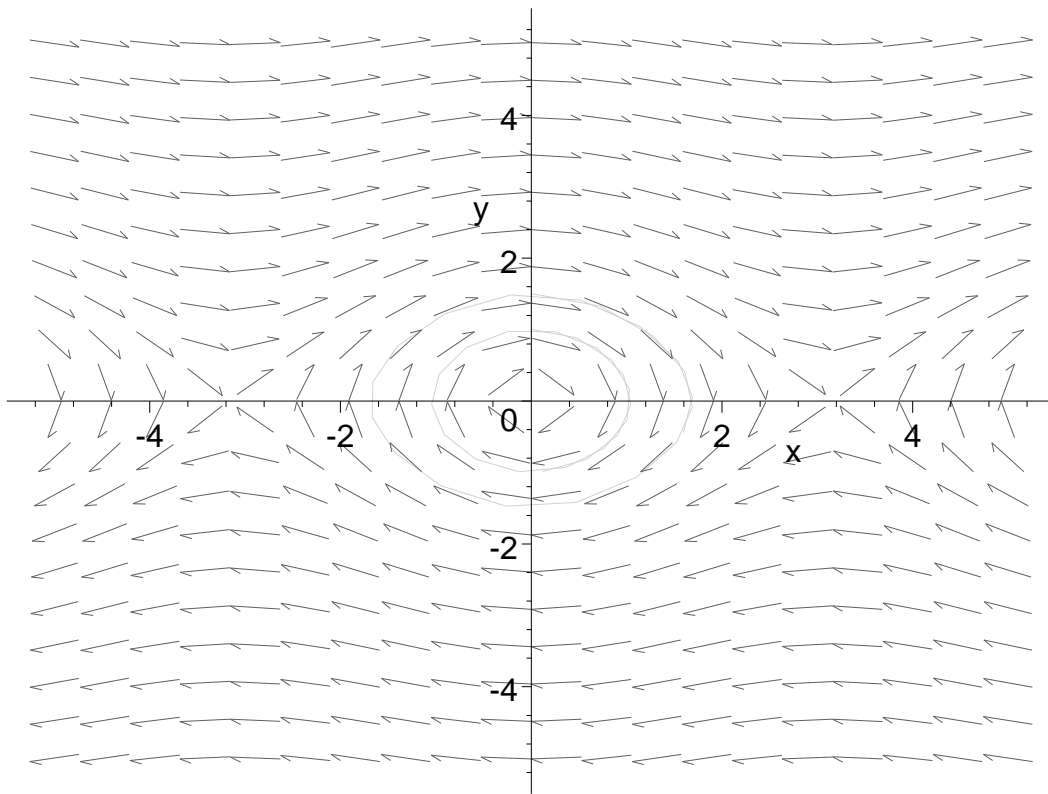
```
> dgl := [diff(x(t), t) = y(t), diff(y(t), t) = -sin(x(t))];
```

$$dgl := \left[\frac{\partial}{\partial t} x(t) = y(t), \frac{\partial}{\partial t} y(t) = -\sin(x(t)) \right]$$

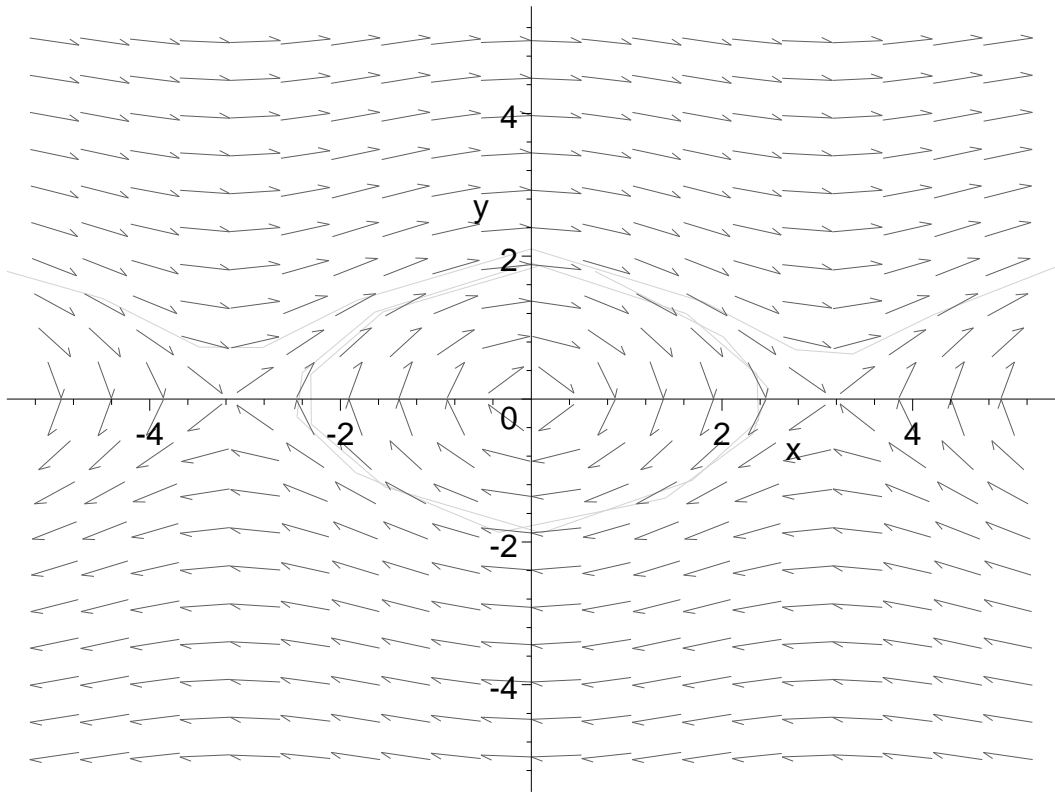
```
> DEplot3d(dgl, [x(t), y(t)], t=0..10, [[x(0)=0, y(0)=1], [x(0)=0, y(0)=3/2]]);
```

```
> phaseportrait(dgl, [x(t), y(t)], t=0..10, [[x(0)
) = 0, y(0) = 1], [x(0) = 0, y(0) = 3/2]], x = -5..5, y = -5
..5);
```



```
> phaseportrait(dgl, [x(t), y(t)], t=-10..10, [[x  
(0)=0, y(0)=1.9], [x(0)=0, y(0)=2.1]], x=-5..5,  
y=-5..5);
```



[>