

```
> dgl:=diff(y(x),x)=(sin(x)+sin(Pi*x))*exp(y(x));
```

$$dgl := \frac{\partial}{\partial x} y(x) = (\sin(x) + \sin(\pi x)) e^{y(x)}$$

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

$$y(x) = -\ln \left(-\frac{-\cos(x)\pi - \cos(\pi x) + \frac{e^c \pi + e^c - \pi}{e^c}}{\pi} \right)$$

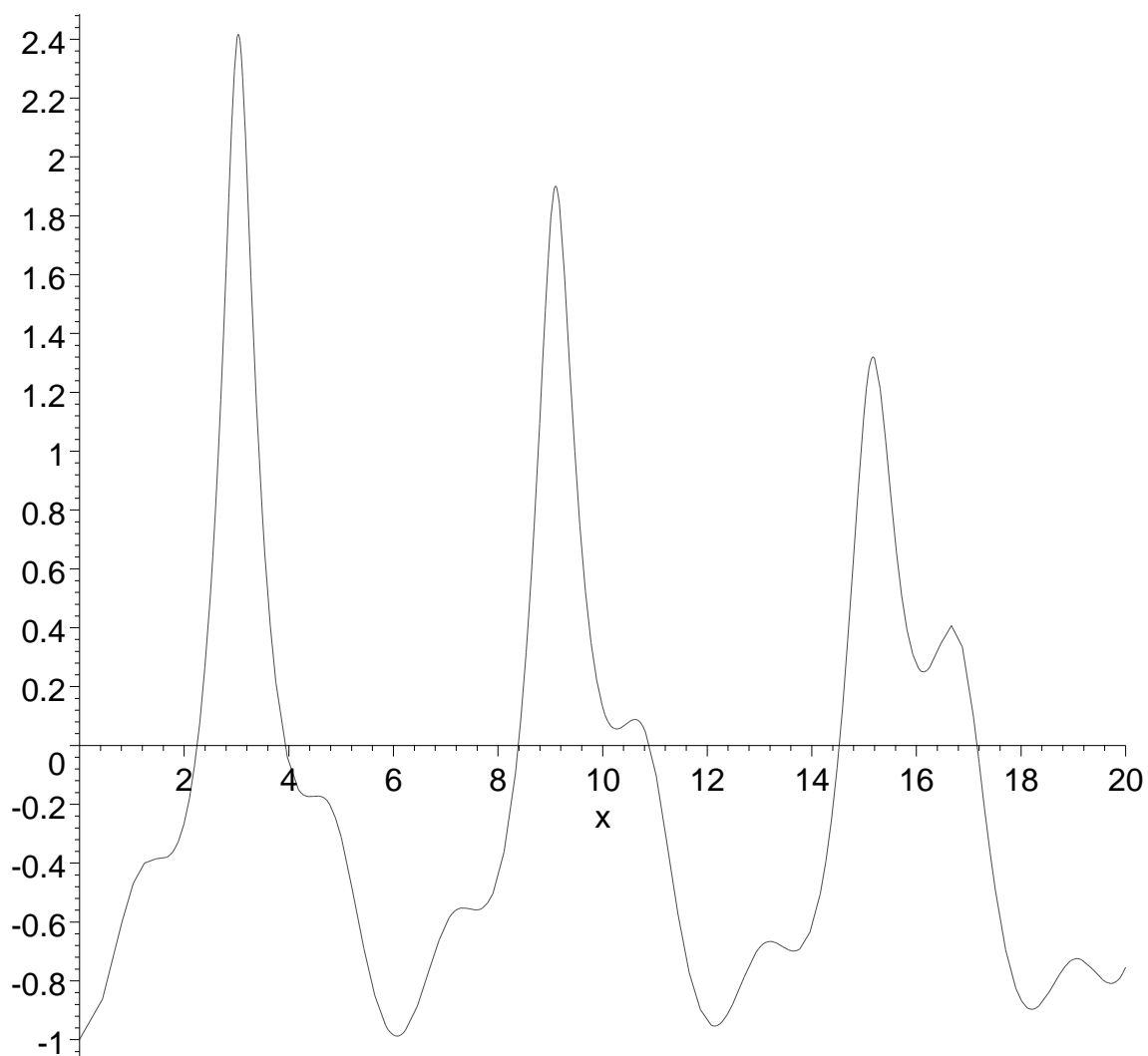
```
> dsolve({dgl, y(0)=-1}, y(x));
```

$$y(x) = -\ln \left(-\frac{-\cos(x)\pi - \cos(\pi x) + \frac{e^{(-1)}\pi + e^{(-1)} - \pi}{e^{(-1)}}}{\pi} \right)$$

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

$$f := -\ln \left(-\frac{-\cos(x)\pi - \cos(\pi x) + \frac{e^{(-1)}\pi + e^{(-1)} - \pi}{e^{(-1)}}}{\pi} \right)$$

```
> plot(f, x=0..20);
```

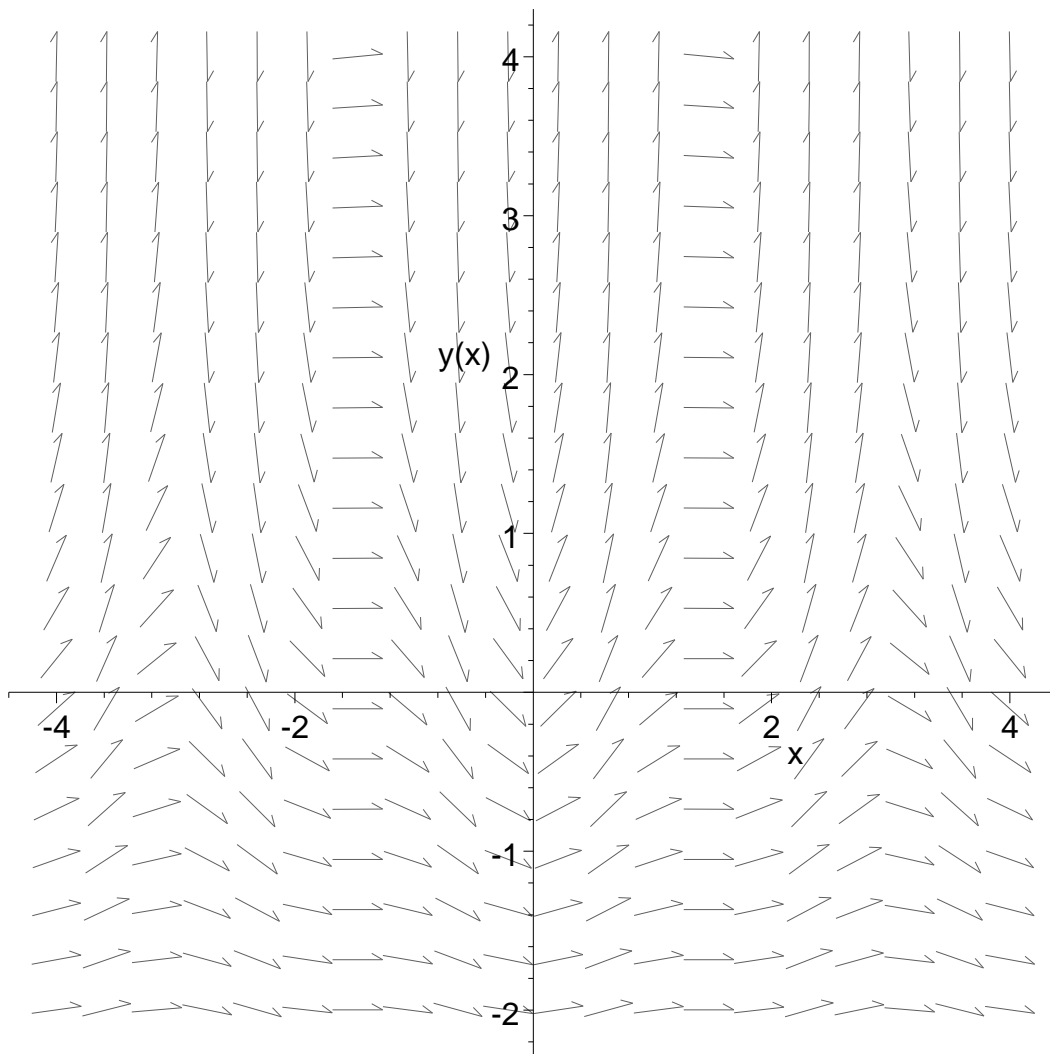


```
> with(DEtools);
```

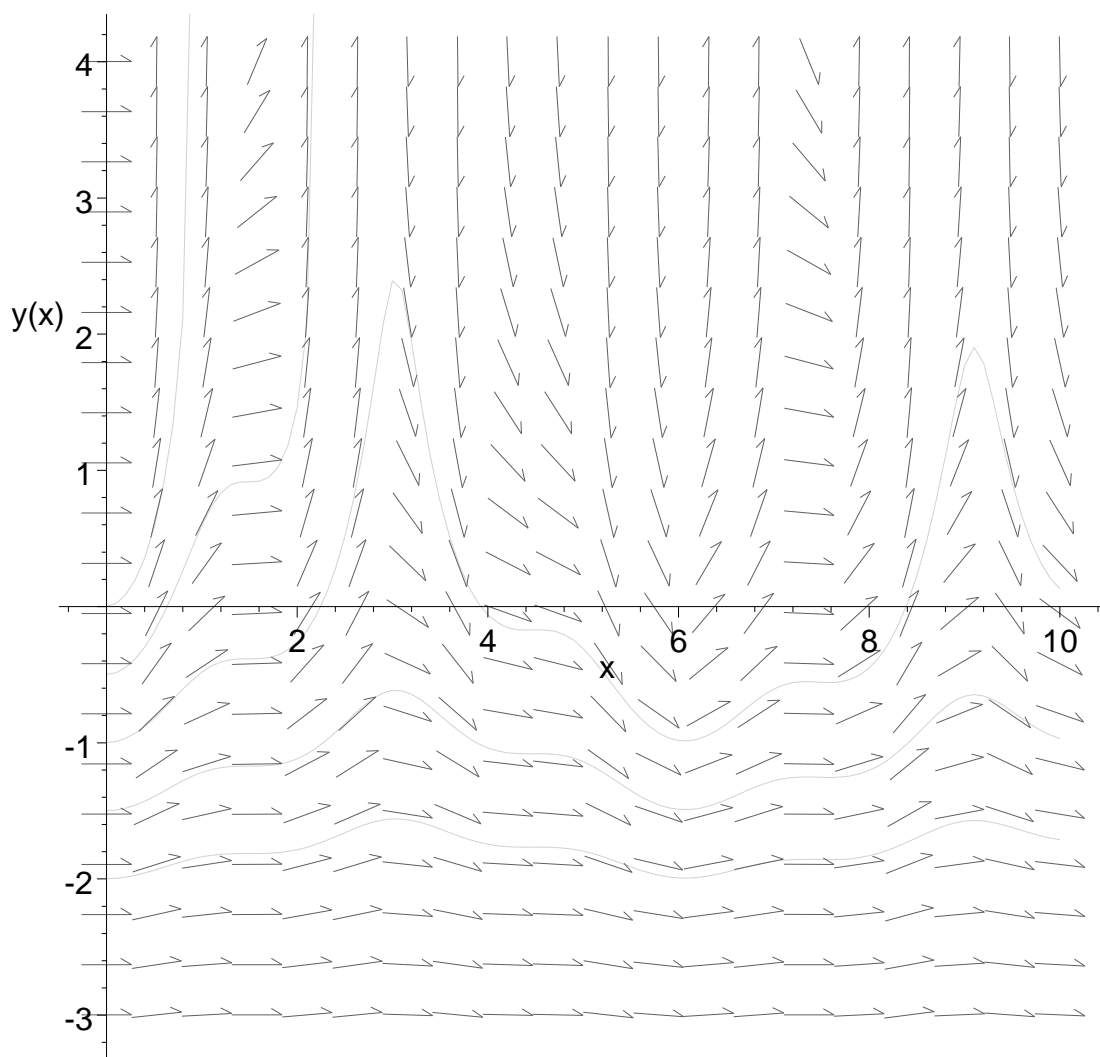
```
[DENormal, DEplot, DEplot3d, DEplot_polygon, DFactor,
  Dchangevar, GCRD, LCLM, PDEchangecoords, RiemannPsols,
  abelsol, adjoint, autonomous, bernoullisol, buildsol, buildsym,
  canoni, chinisol, clairautsol, constcoeffsols, convertAlg,
```

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, kovacicssols, 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..4) ;



```
> DEplot(dgl, y(x), x=0..10, y=-3..4, [[y(0)=0], [
y(0)=-0.5], [y(0)=-1], [y(0)=-1.5], [y(0)=-2]]
, 'stepsize=0.1');
```



```
> dgl:=D(y)(x)=y(x)*(2-sin(x))-(2+cos(x^2))*y(x)^2;
```

$$dgl := D(y)(x) = y(x) (2 - \sin(x)) - (2 + \cos(x^2)) y(x)^2$$

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

$$y(x) = 1 / \left(\right.$$

$$e^{(-2x - \cos(x))} \left(2 \int (e^x)^2 e^{\cos(x)} dx + \int (e^x)^2 e^{\cos(x)} \cos(x^2) dx + _C1 \right)$$

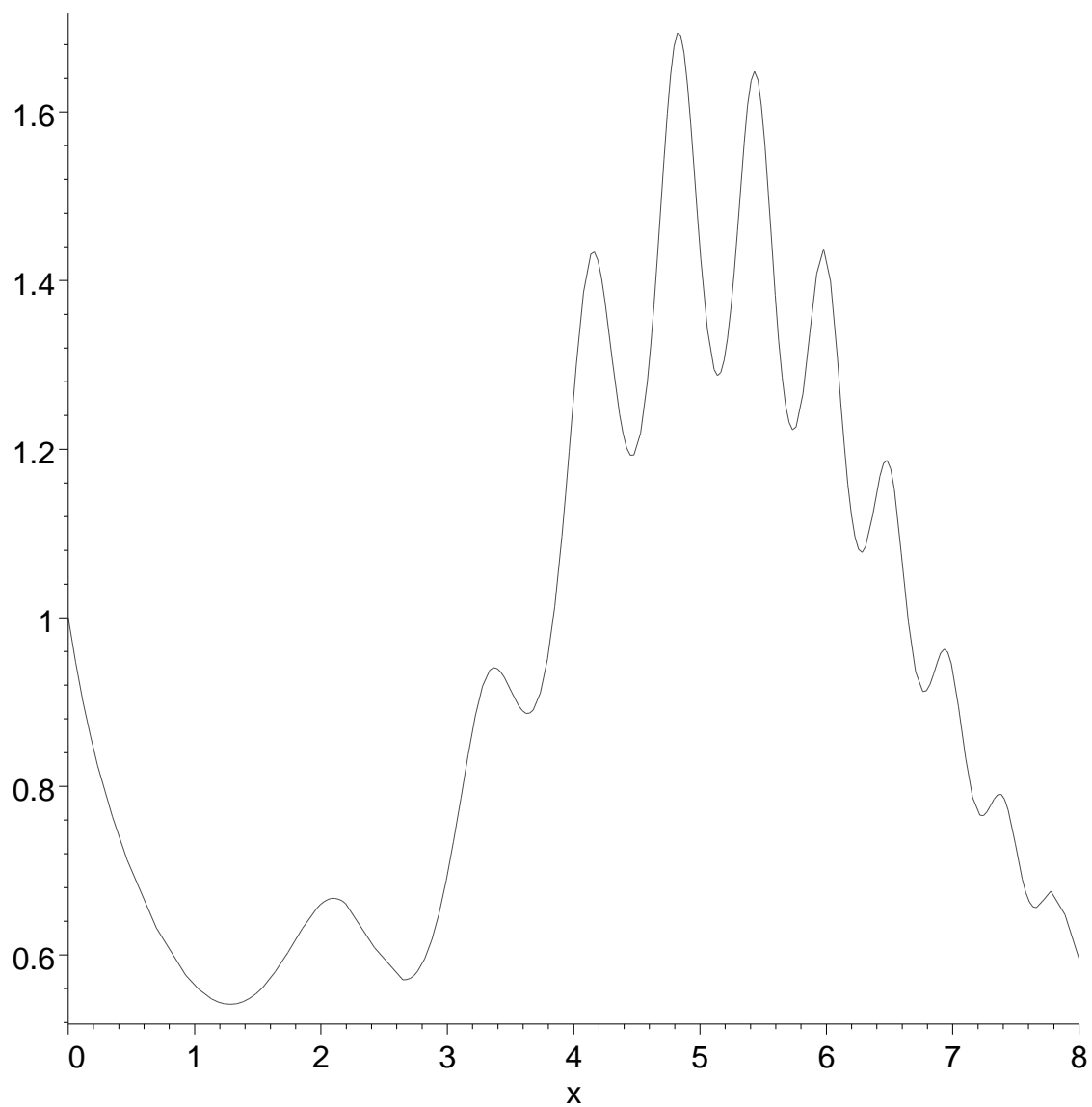
```
> dsolve({dgl, y(0)=1}, y(x));
```

$$y(x) = 1 / \left(e^{(-2x - \cos(x))} \left(2 \int_0^x (e^u)^2 e^{\cos(u)} du + \int_0^x (e^u)^2 e^{\cos(u)} \cos(u^2) du + \frac{1}{\cosh(1) - \sinh(1)} \right) \right)$$

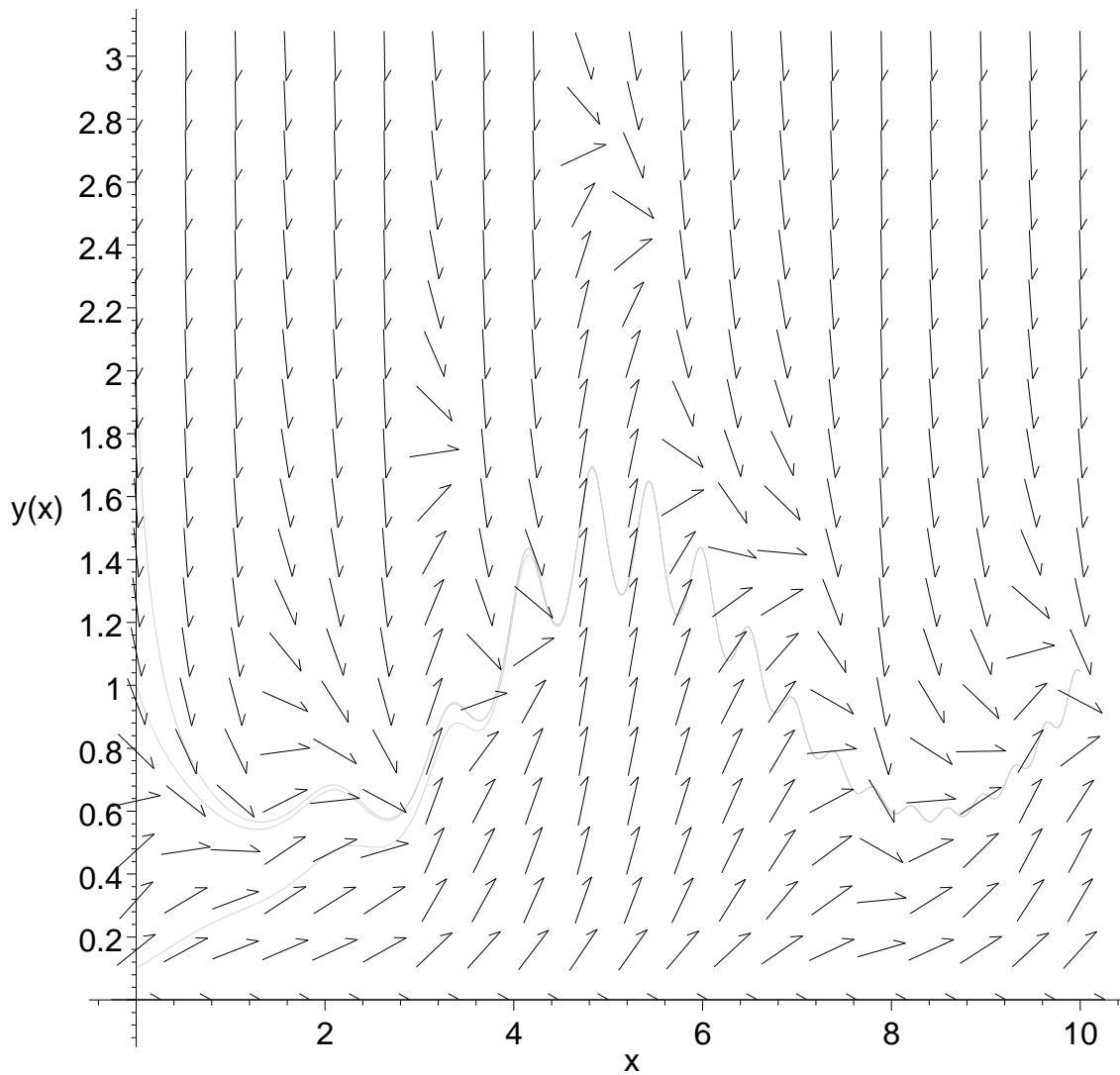
```
> f:=rhs(%);
```

$$f := 1 / \left(e^{(-2x - \cos(x))} \left(2 \int_0^x (e^u)^2 e^{\cos(u)} du + \int_0^x (e^u)^2 e^{\cos(u)} \cos(u^2) du + \frac{1}{\cosh(1) - \sinh(1)} \right) \right)$$

```
> plot(f, x=0..8, numpoints=10);
```



```
> DEplot(dgl, y(x), x=0..10, y=0..3, [[y(0)=0.1],  
[y(0)=1], [y(0)=2]], 'stepsize=0.01', color=black);
```



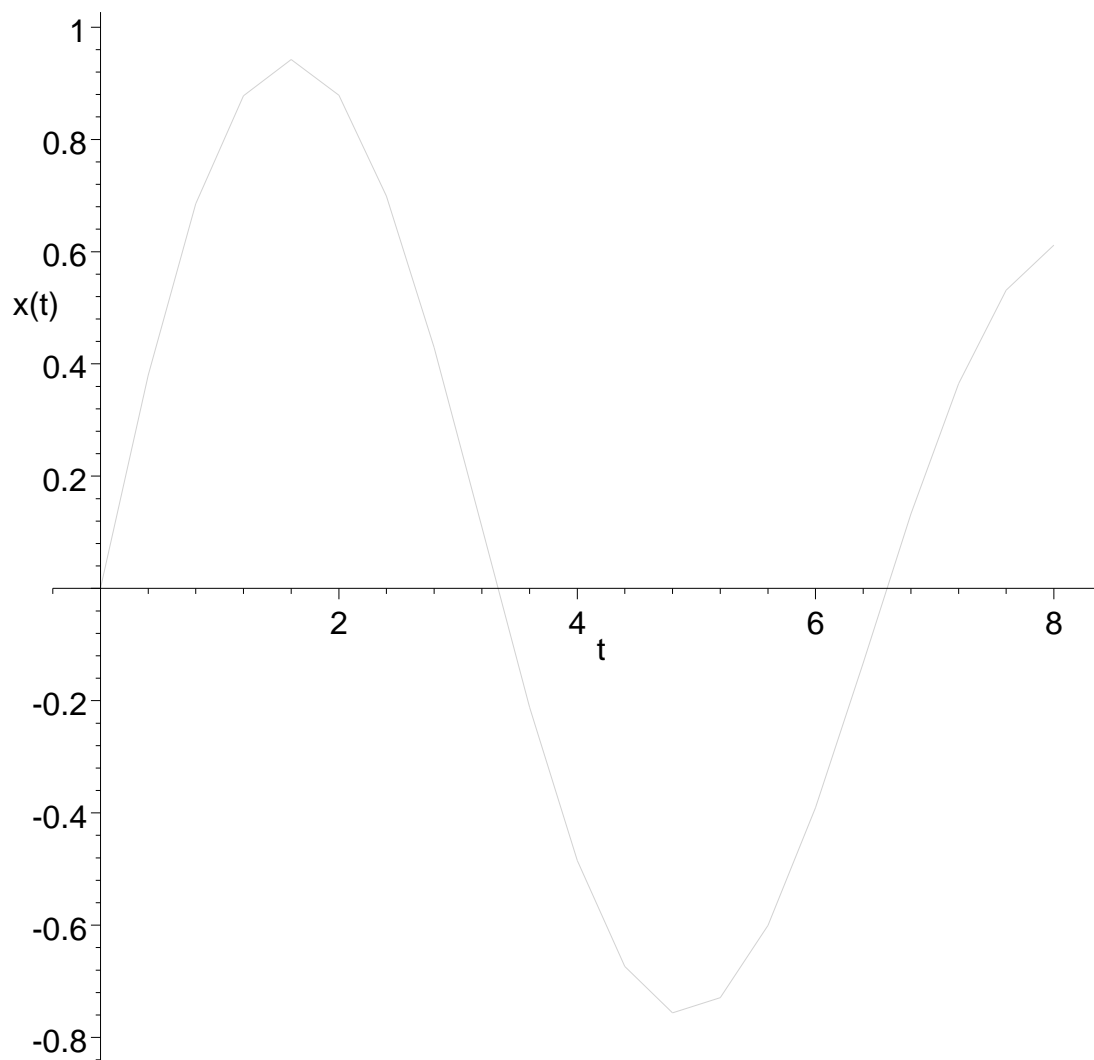
[>
 [>
 [>

> dgl:=diff(x(t),t,t)+1/8*diff(x(t),t)+sin(x(t))=0;

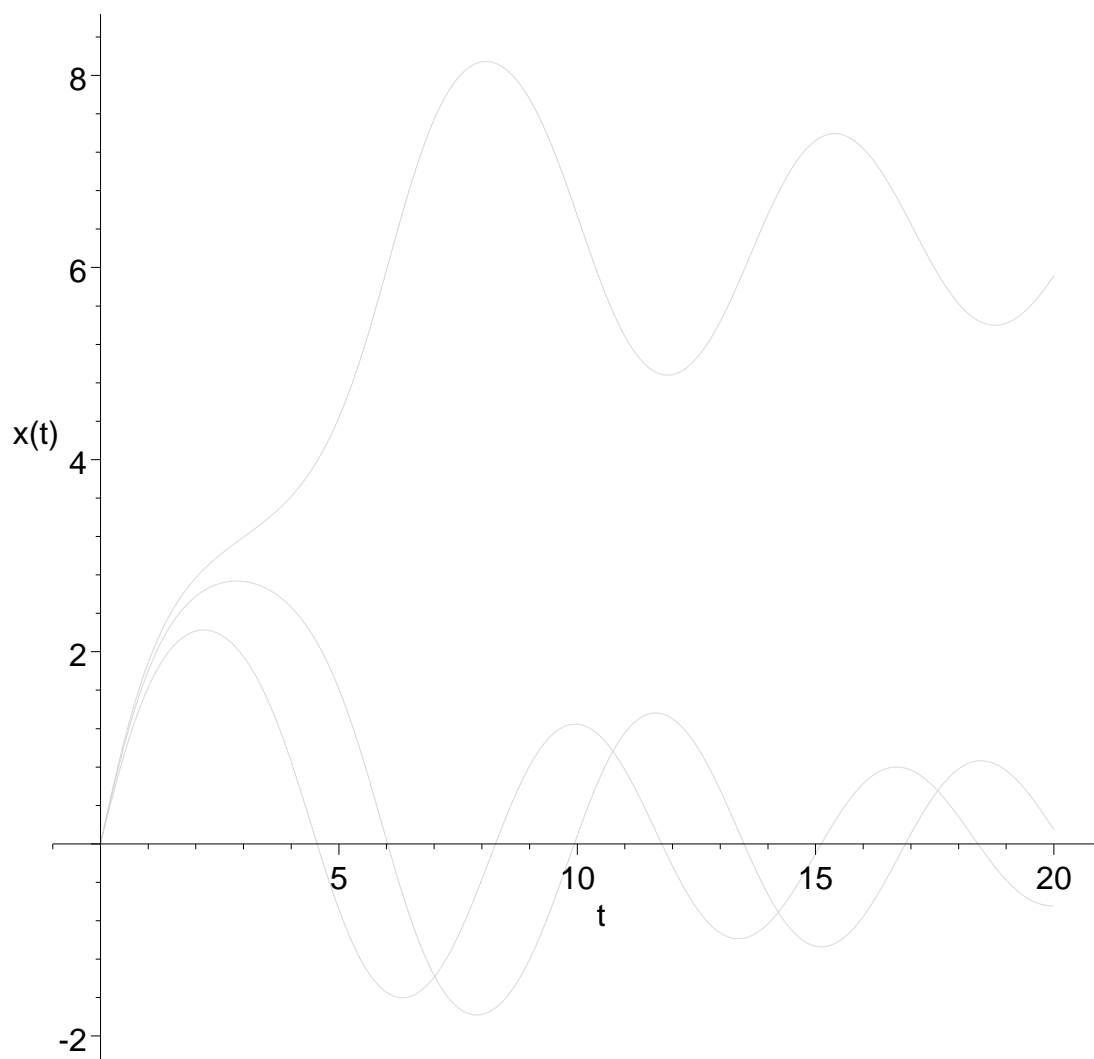
$$dgl := \left(\frac{\partial^2}{\partial t^2} x(t) \right) + \frac{1}{8} \left(\frac{\partial}{\partial t} x(t) \right) + \sin(x(t)) = 0$$

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

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



```
> DEplot(dgl, x(t), t=0..20, [[x(0)=0, D(x)(0)=2]  
, [x(0)=0, D(x)(0)=2.2], [x(0)=0, D(x)(0)=2.3]]  
, 'stepsize=0.01');
```



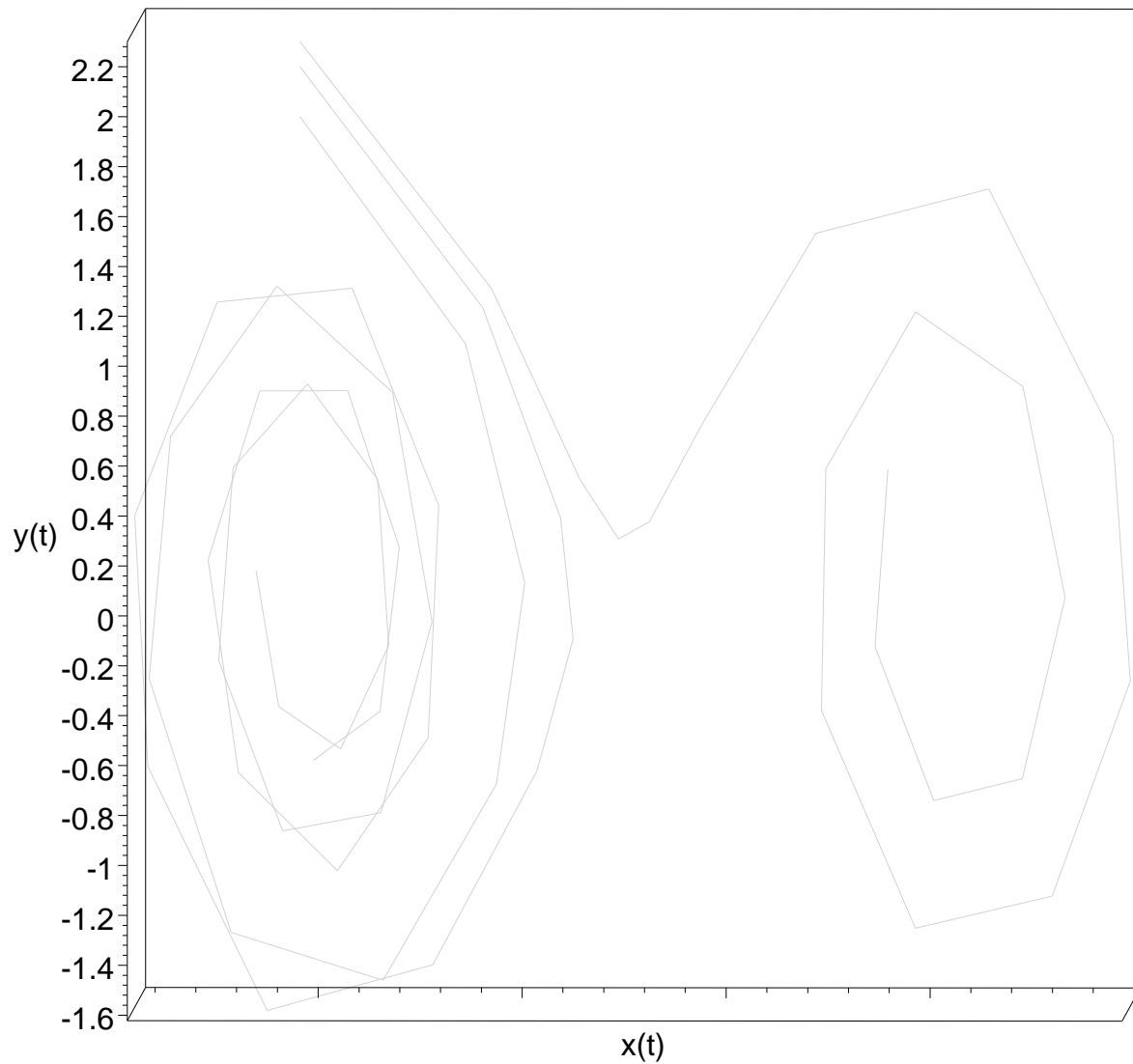
```
> dgl := [diff(x(t), t) = y(t), diff(y(t), t) = -y(t) /
8 - sin(x(t))];
```

$$dgl := \left[\frac{\partial}{\partial t} x(t) = y(t), \frac{\partial}{\partial t} y(t) = -\frac{1}{8} y(t) - \sin(x(t)) \right]$$

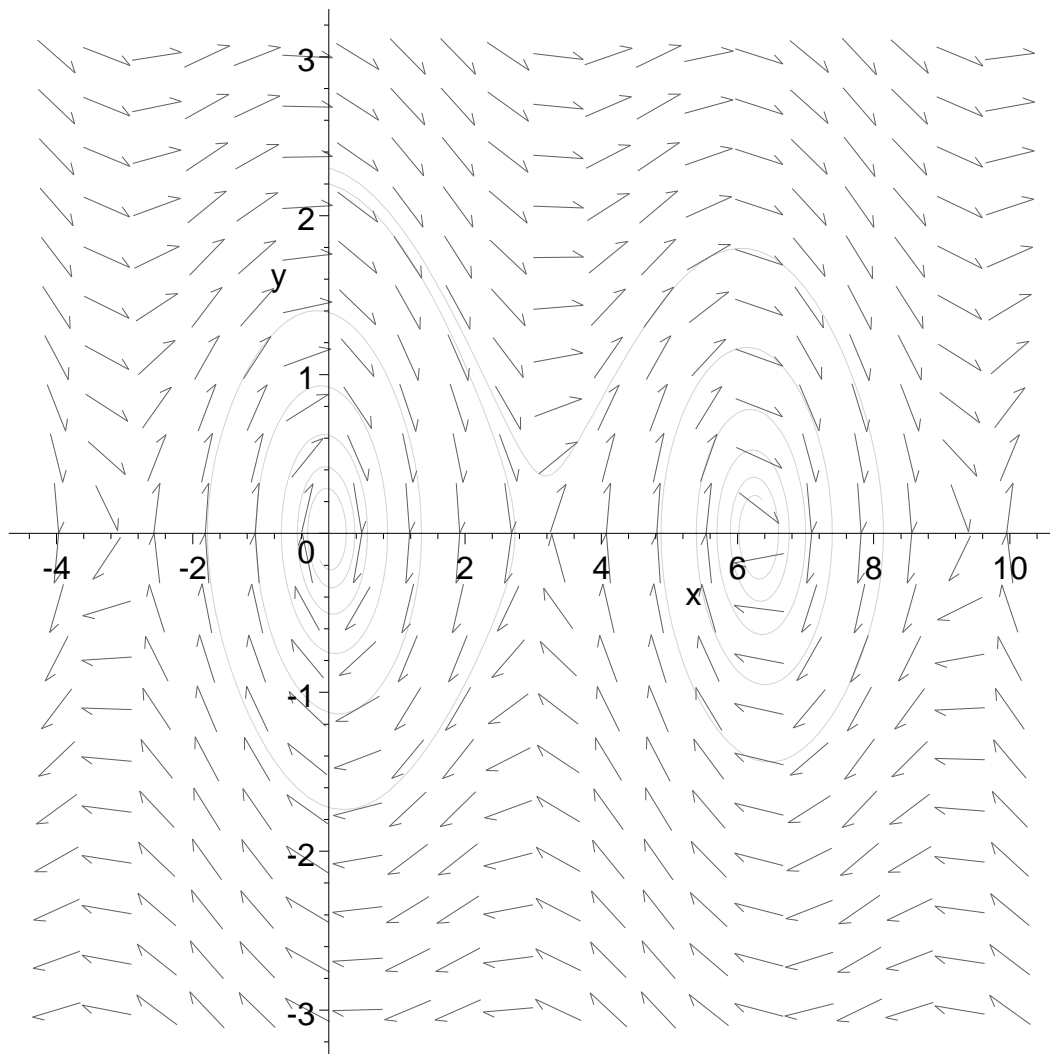
```
> DEplot3d(dgl, [x(t), y(t)], t=0..20, [[x(0)=0, y
```

```
(0)=2], [x(0)=0,y(0)=2.2], [x(0)=0,y(0)=2.3]]  

```



```
> phaseportrait(dgl,[x(t),y(t)],t=0..40,[[x(0)  
)=0,y(0)=0],[x(0)=0,y(0)=2.2],[x(0)=0,y(0)=  
2.3]],x=-4..10,y=-3..3,'stepsize=0.1');
```



```
> a:=3;b:=2;c:=2;d:=1;
```

```
    a:=3
```

```
    b:=2
```

```
    c:=2
```

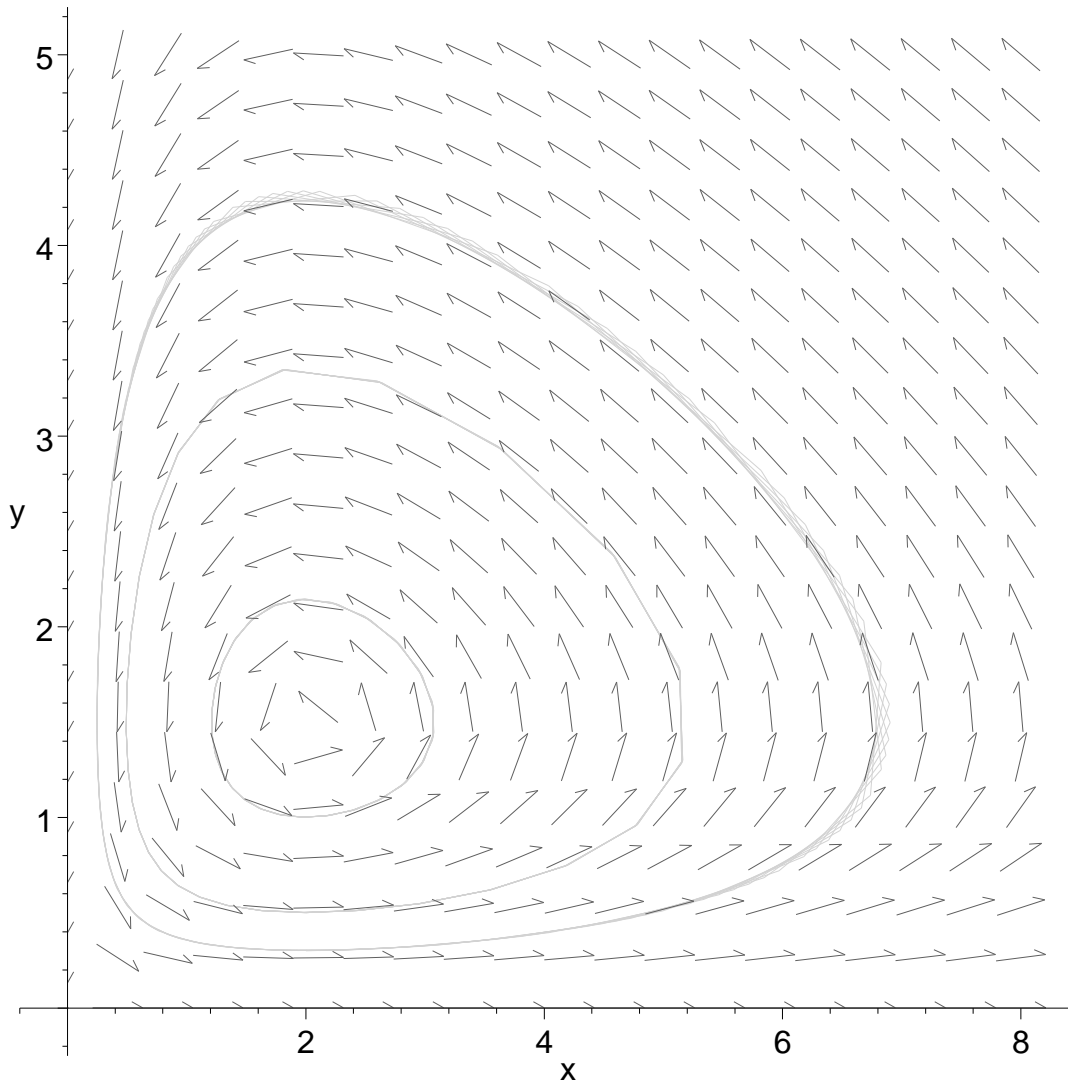
```
    d:=1
```

```
> dgl:=[diff(x(t),t)=x(t)*(a-b*y(t)),diff(y(t)
```

```
) , t) = y (t) * (-c+d*x (t)) ] ;
```

$$dgl := \left[\frac{\partial}{\partial t} x(t) = x(t) (3 - 2 y(t)), \frac{\partial}{\partial t} y(t) = y(t) (-2 + x(t)) \right]$$

```
> phaseportrait (dgl, [x (t) , y (t) ] , t=0..20, [[x (0)  
)=2, y (0)=0.5], [x (0)=2, y (0)=1], [x (0)=2, y (0)=  
0.3]], x=0..8, y=0..5, 'stepsize=0.1' );
```



```
> a:=3;b:=2;c:=3;d:=1;
```

```
    a:=3
```

```
    b:=2
```

```
    c:=3
```

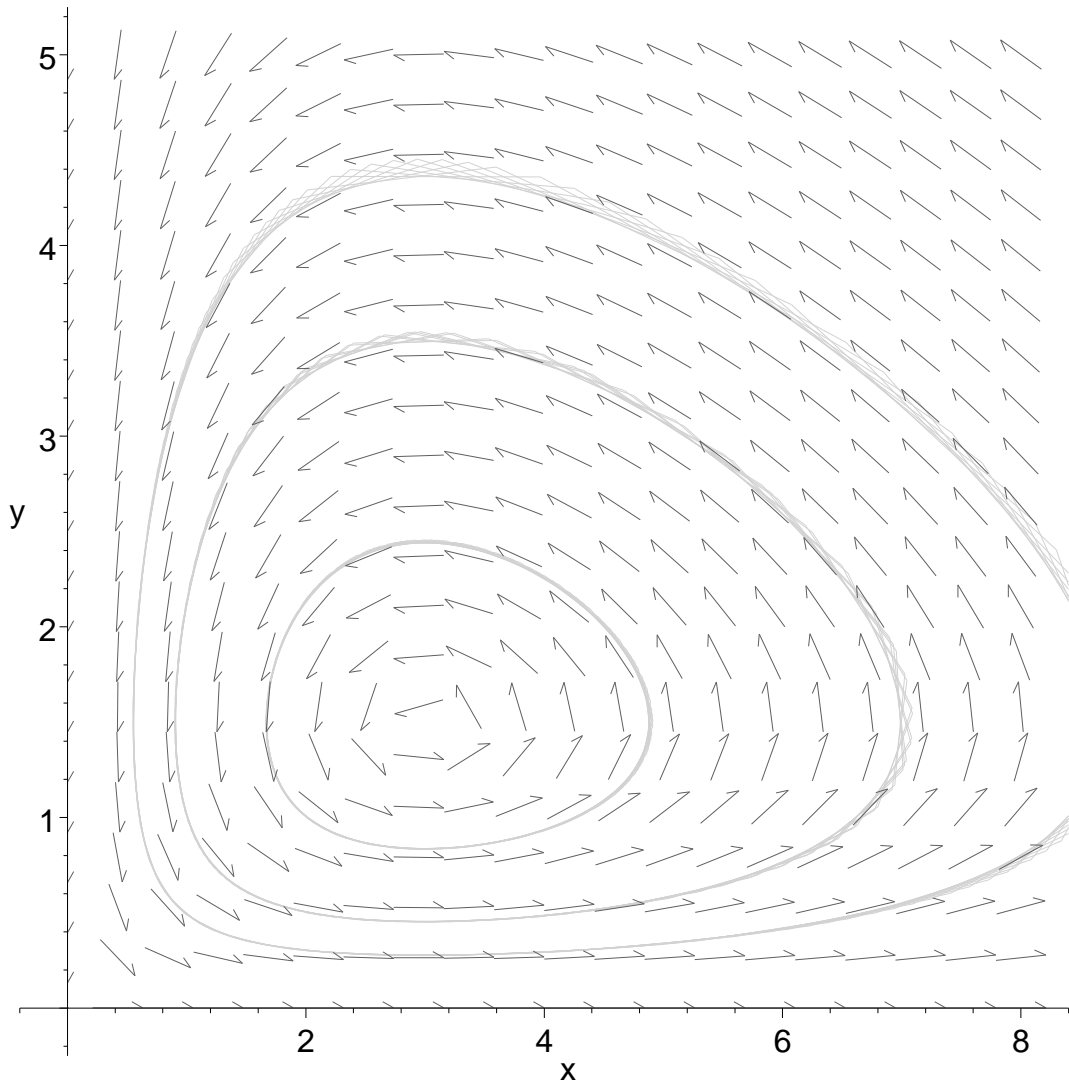
```
    d:=1
```

```
> dgl:=[diff(x(t),t)=x(t)*(a-b*y(t)),diff(y(t)
```

```
) , t) = y (t) * (-c+d*x (t)) ] ;
```

$$dgl := \left[\frac{\partial}{\partial t} x(t) = x(t) (3 - 2 y(t)), \frac{\partial}{\partial t} y(t) = y(t) (-3 + x(t)) \right]$$

```
> phaseportrait (dgl, [x (t) , y (t) ] , t=0..20, [[x (0)  
)=2, y (0)=0.5], [x (0)=2, y (0)=1], [x (0)=2, y (0)=  
0.3]], x=0..8, y=0..5, 'stepsize=0.1' );
```

[>