ORDINÄRA DIFFERENTIALEKVATIONER; SYMBOLISK LÖSNING

Exempel 1

```
> diff(y(x),x);
```

$$\frac{\partial}{\partial x}\mathrm{y}(x)$$

```
> diff(y(x),x$2);
```

$$\frac{\partial^2}{\partial x^2}\mathrm{y}(x)$$

Exempel 2

```
> diff(sin(x^2),x);
```

$$2\cos(x^2)\,x$$

```
> diff(sin(x^2),x$2);
```

$$-4\sin(x^2)\,x^2+2\cos(x^2)$$

Exempel 3

```
> dsolve(diff(y(x),x)-y(x)=x^2,y(x));
```

$$\mathrm{y}(x)=-x^2-2\,x-2+\mathbf{e}^{x}\,\_C1$$

Exempel 4

```
> dsolve({diff(y(x),x$2)-y(x)=x^2,y(0)=0, D(y)(0)=1},y(x));
```

$$\mathrm{y}(x)=\frac{1}{2}\mathbf{e}^{(-x)}+\frac{3}{2}\mathbf{e}^{x}-2-x^2$$

Exempel 5

```
> deq:=diff(y(x),x)=1/((y(x)-1)*(y(x)-2)*(y(x)-3));
```

$$deq:=\frac{\partial}{\partial x}\mathrm{y}(x)=\frac{1}{(\mathrm{y}(x)-1)\,(\mathrm{y}(x)-2)\,(\mathrm{y}(x)-3)}$$

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

$$\mathrm{y}(x)=2-\sqrt{1+\sqrt{9+4\,x+4\,\_C1}},\ \mathrm{y}(x)=2+\sqrt{1-\sqrt{9+4\,x+4\,\_C1}},$$
$$\mathrm{y}(x)=2-\sqrt{1-\sqrt{9+4\,x+4\,\_C1}},\ \mathrm{y}(x)=2+\sqrt{1+\sqrt{9+4\,x+4\,\_C1}}$$

```
> dsolve(deq,y(x),implicit);
```

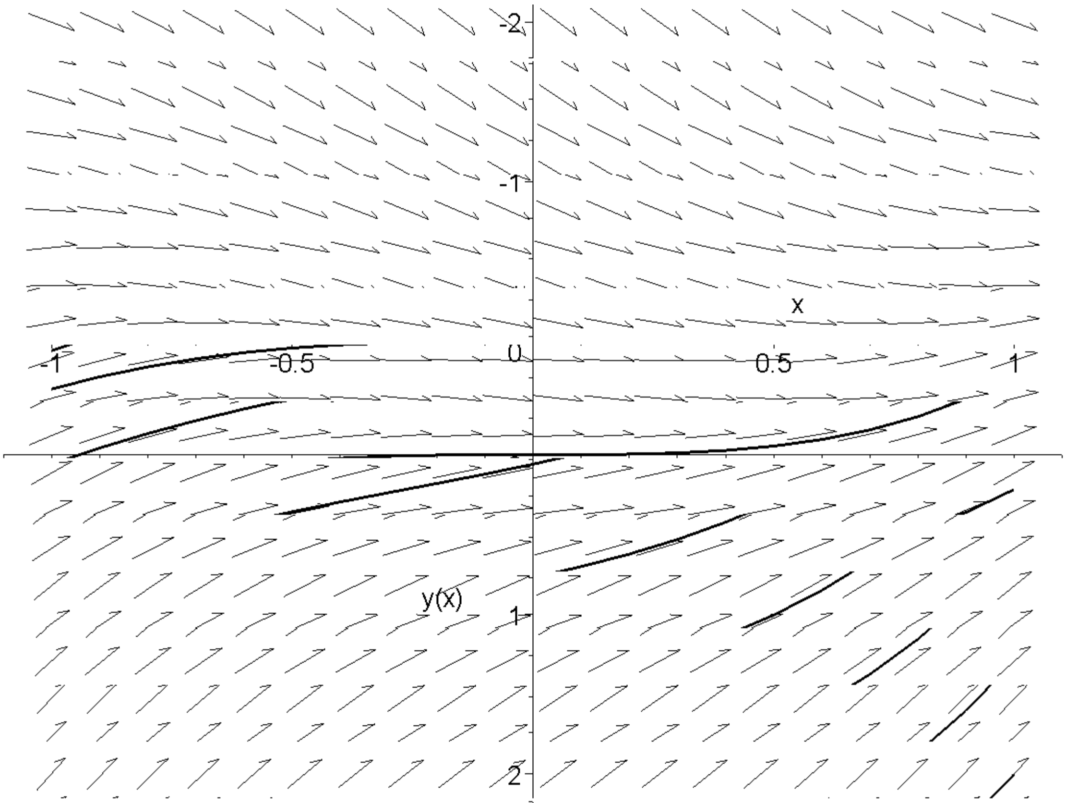
$$x-\frac{1}{4}\mathrm{y}(x)^4+2\,\mathrm{y}(x)^3-\frac{11}{2}\mathrm{y}(x)^2+6\,\mathrm{y}(x)+\_C1=0$$

ATT PLOTTA RIKTNINGSFÄLT OCH LÖSNINGSKURVOR TILL ODE

Exempel 6 (extra-argumenten "color=black" "linecolor=black" som strax får sin förklaring, används för att dessa exempel ska bli bättre i tryck)

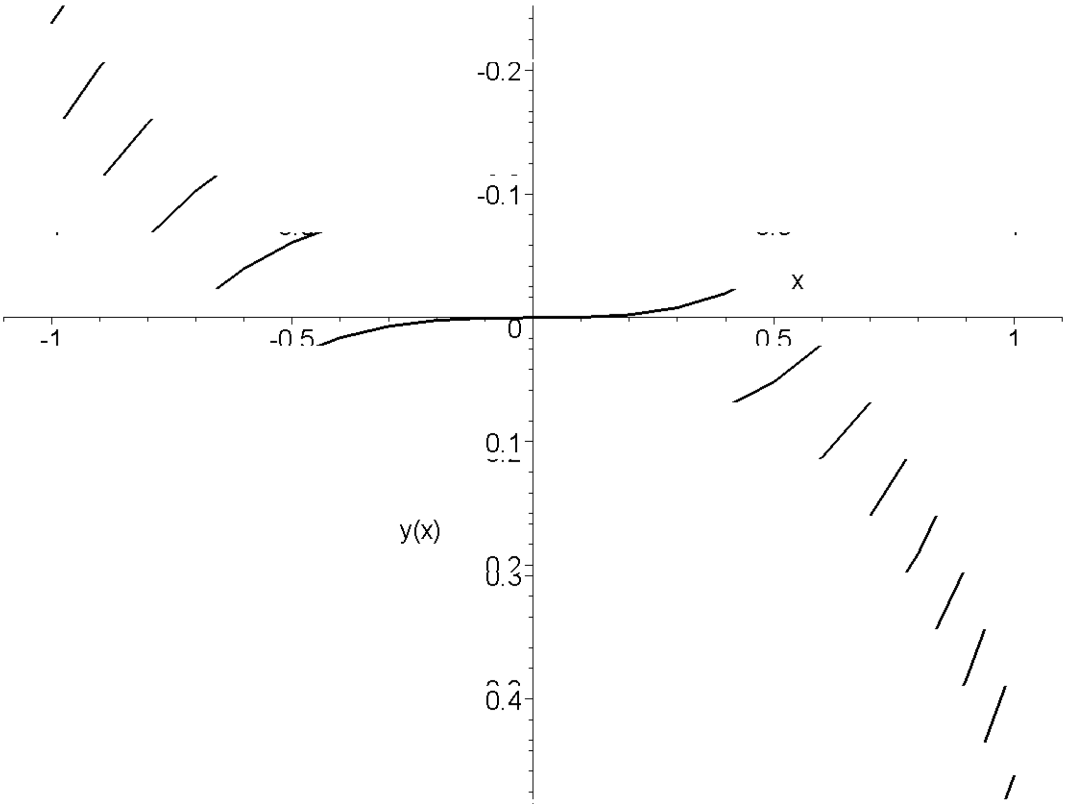
```
> with(DEtools):
```

```
> DEplot(diff(y(x),x)-y(x)=x^2,y(x),x=-1..1,[[y(0)=0],[y(1)=2]]
  ,y=-2..2,color=black,linecolor=BLACK);
```



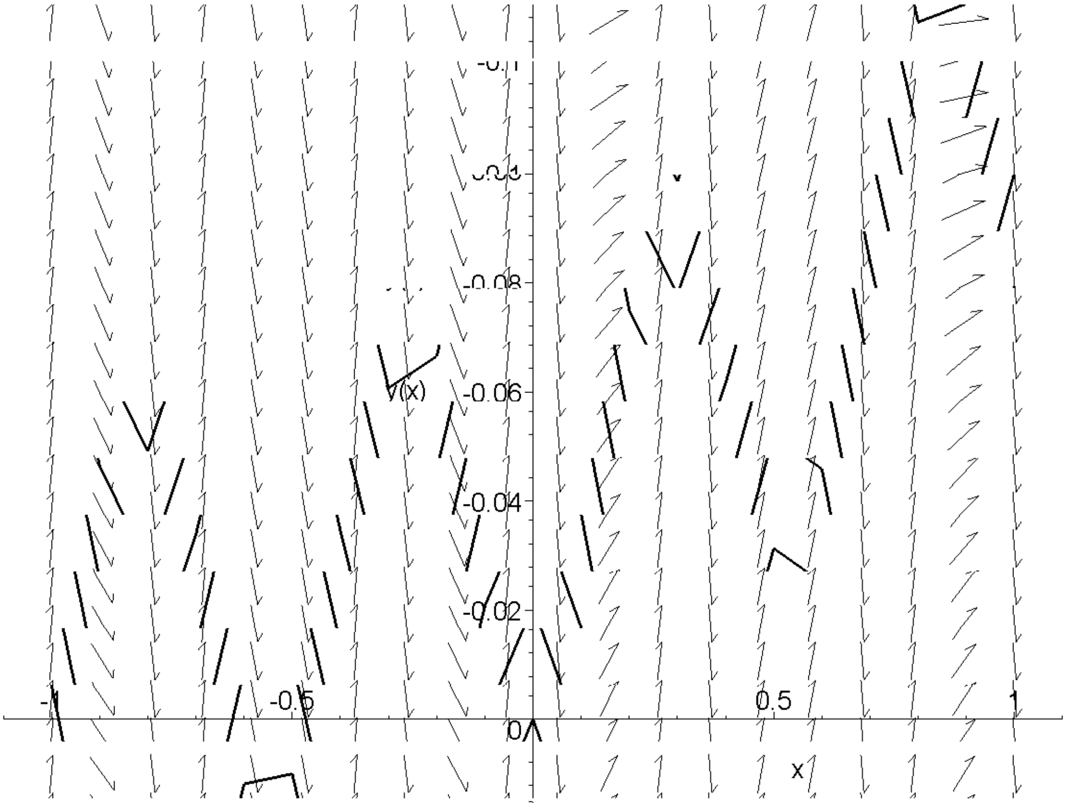
Exempel 7

```
> DEplot(diff(y(x),x)-y(x)=x^2,y(x),x=-1..1,[[y(0)=0]],linecolo
  r=BLACK,arrows=NONE);
```

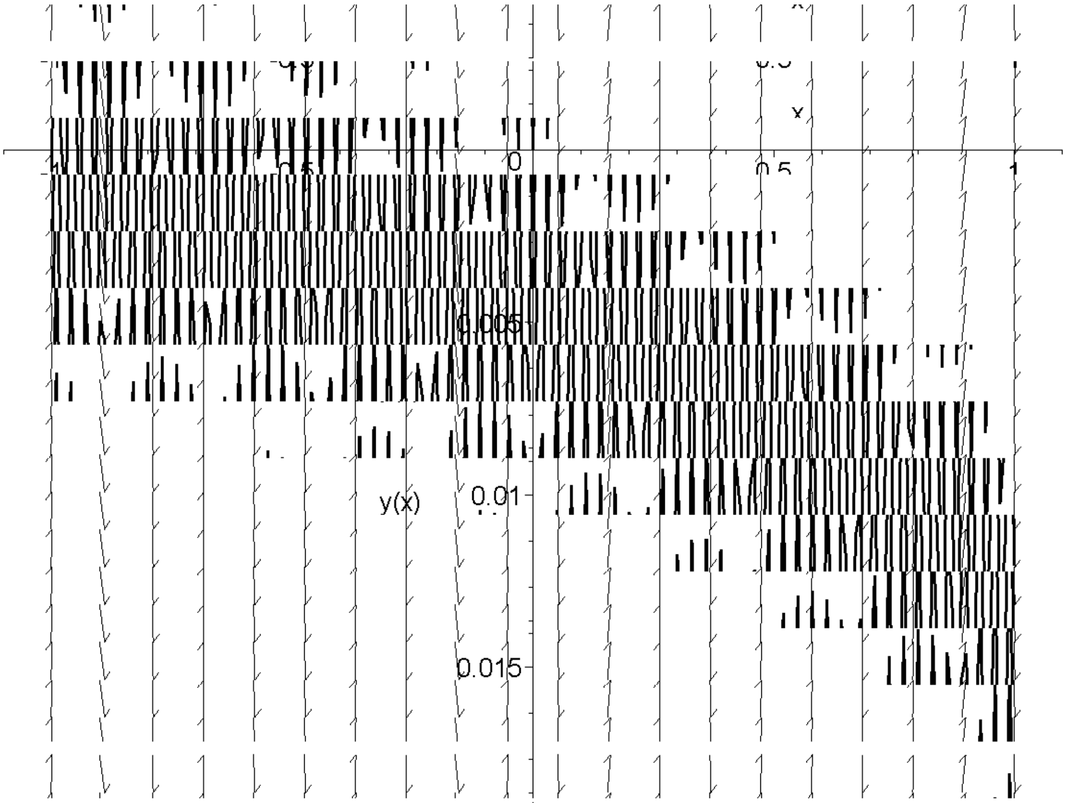


Exempel 8

```
> DEplot(diff(y(x),x)-y(x)=sin(200*x),y(x),x=-1..1,[[y(0)=0]],l
  inecolor=BLACK,color=BLACK);
```




```
> DEplot(diff(y(x),x)-y(x)=sin(200*x),y(x),x=-1..1,[[y(0)=0]],s
  tepsize=0.01,linecolor=BLACK,color=BLACK);
```



NÅGRA TIPS OM HANTERING AV EKVATIONER OCH PLOTTAR

Exempel 9

```
> deq:=diff(y(x),x)-y(x)=x^2;
  init:=y(0)=0;
  inits:=[[y(0)=0],[y(1)=2]];
```

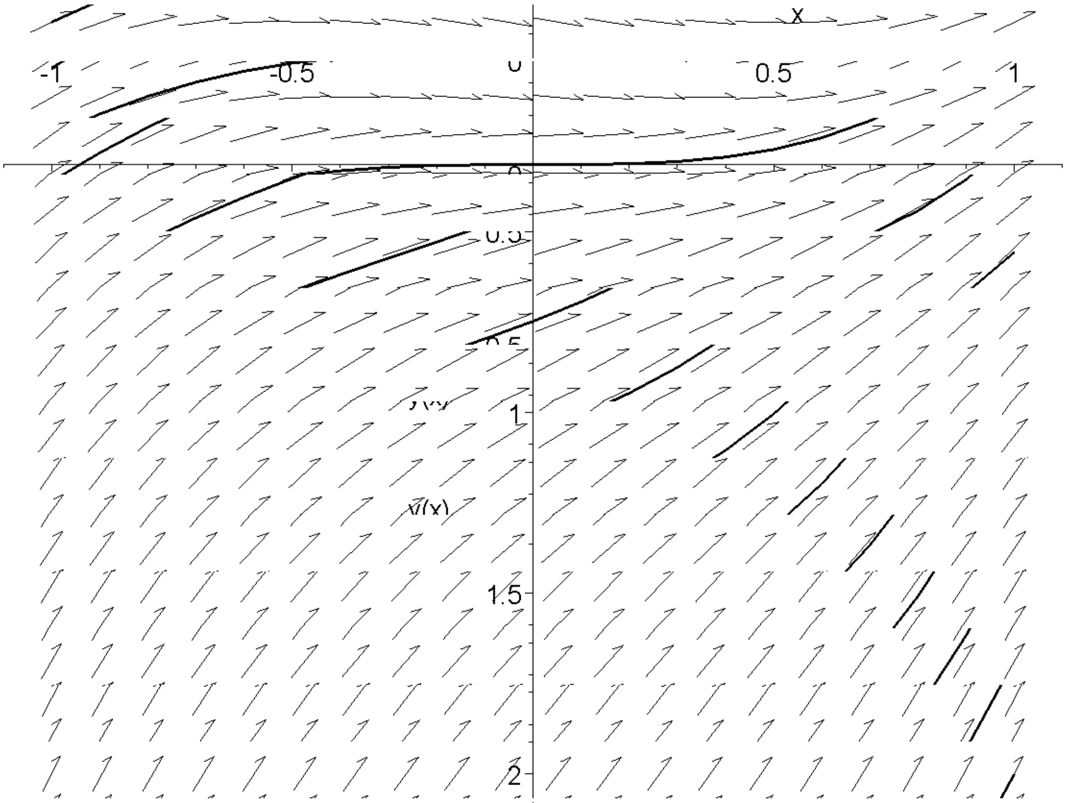
```
dsolve({deq,init},y(x));
DEplot(deq,y(x),x=-1..1,inits,linecolor=BLACK,color=BLACK);
```

$$deq := \left(\frac{\partial}{\partial x}\mathrm{y}(x)\right) - \mathrm{y}(x) = x^2$$

$$init := \mathrm{y}(0) = 0$$

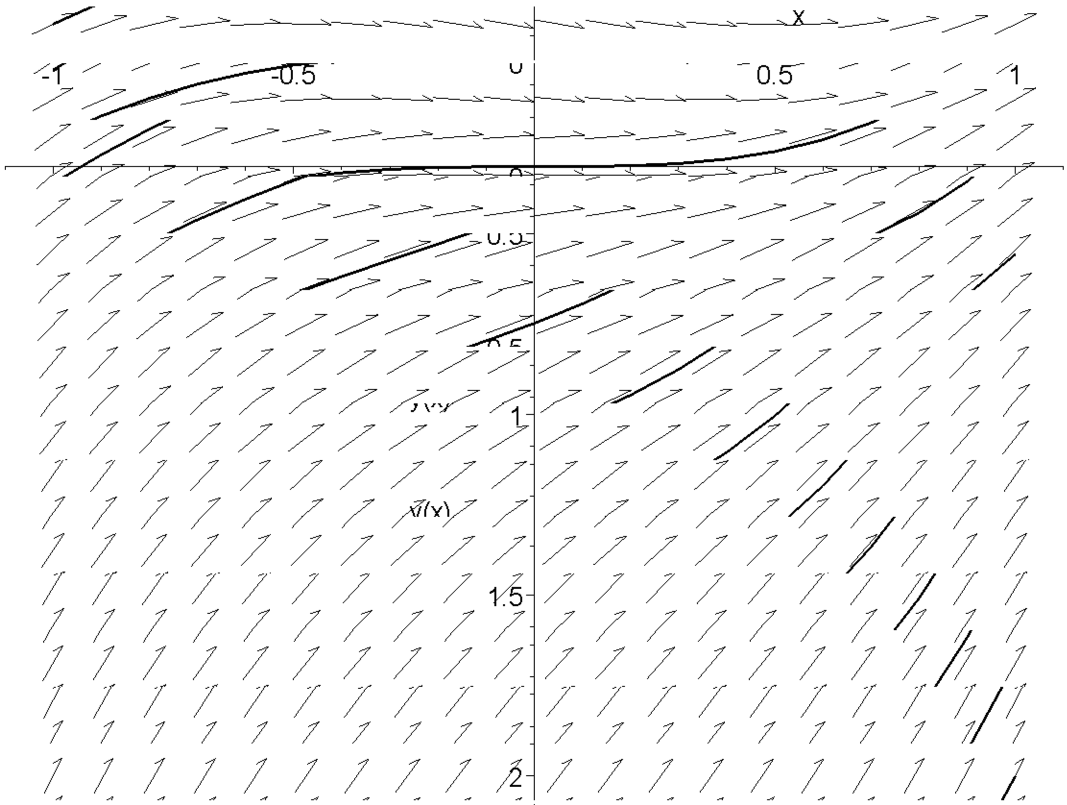
$$inits := [[\mathrm{y}(0) = 0], [\mathrm{y}(1) = 2]]$$

$$\mathrm{y}(x) = -x^2 - 2\,x - 2 + 2\,\mathbf{e}^x$$



Exempel 10

```
> plot1:=DEplot(deq,y(x),x=-1..1,inits,linecolor=BLACK,color=BL
  ACK):
> with(plots):
> display(plot1);
```



ATT RITA FASPORTRÄTT FÖR SYSTEM AV 1:A ORDNINGENS ODE

Exempel 11

```
> with(DEtools):
> eq1:=diff(x(t),t)=2*sin(y(t)^3);
```

$$eq1 := \frac{\partial}{\partial t}\, \mathrm{x}(t) = 2\, \sin(\mathrm{y}(t)^3)$$

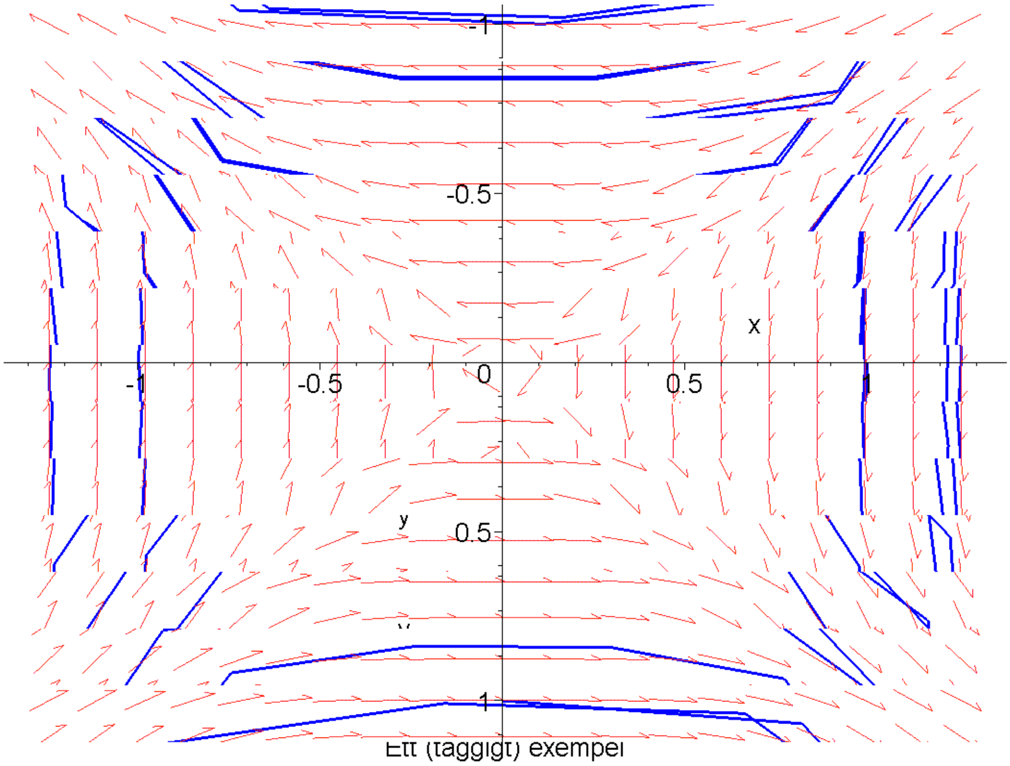
```
> eq2:=diff(y(t),t)=-sin(x(t)^3);
```

$$eq2 := \frac{\partial}{\partial t}\, \mathrm{y}(t) = -\sin(\mathrm{x}(t)^3)$$

```
> inits:=[[x(0)=0,y(0)=1],[x(0)=1,y(0)=0]];
```

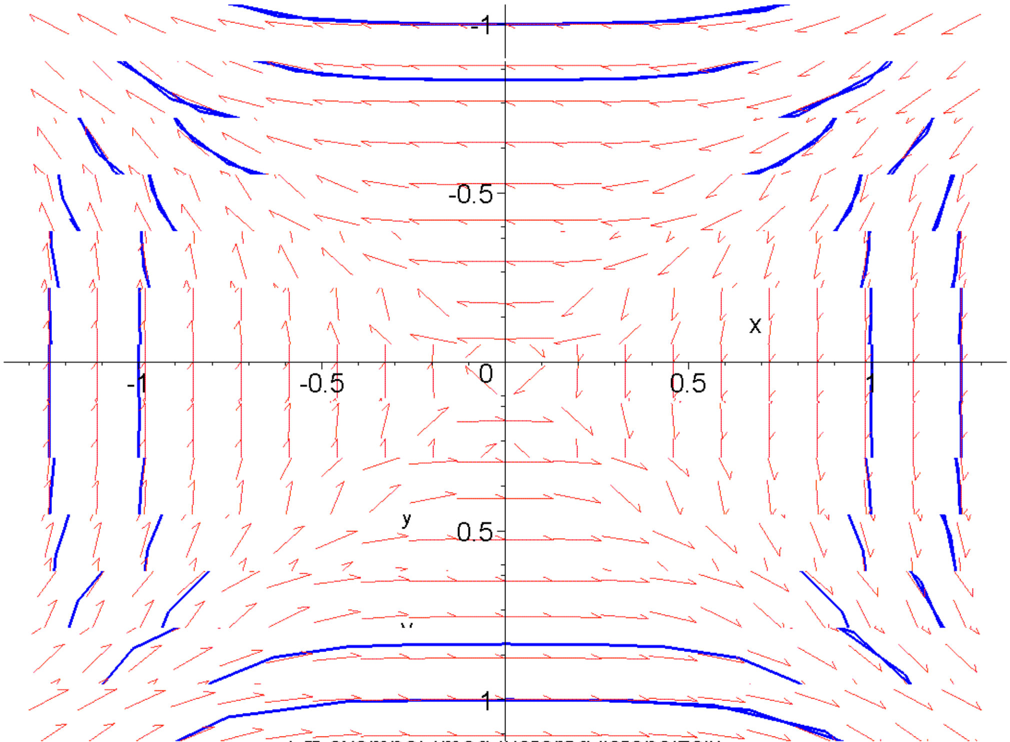
$$inits := [[\mathrm{x}(0) = 0, \mathrm{y}(0) = 1], [\mathrm{x}(0) = 1, \mathrm{y}(0) = 0]]$$

```
> DEplot(\{eq1,eq2\},\{x(t),y(t)\},t=0..10,inits,linecolor=blue
  ,title=`Ett (taggigt) exempel`);
```



Ett (taggigt) exempel

```
> DEplot(\{eq1,eq2\},\{x(t),y(t)\},t=0..10,inits,stepsize=0.2,l
  inecolor=blue,title=`Ett exempel (med justerad "stepsize")`);
```



Ett exempel (med justerad "stepsize")

```
>
```