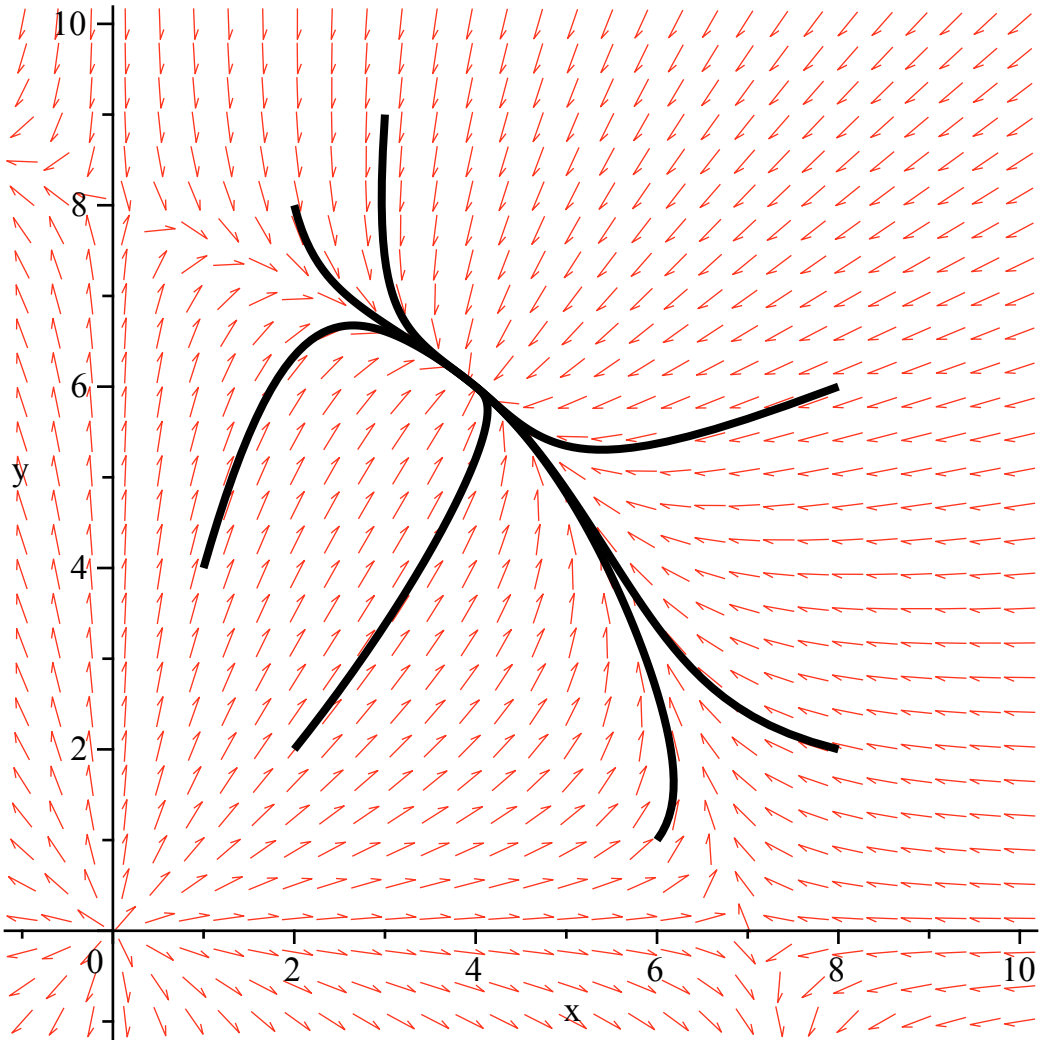
Math 2280-2

Example 6.1.1 Squirrel and Rabbit population

```
> with(DEtools):
> ics:=[[x(0)=8,y(0)=2], [x(0)=2,y(0)=8], [x(0)=2,y(0)=2],[x(0)=8,
  y(0)=6],[x(0)=1,y(0)=4],[x(0)=3,y(0)=9],[x(0)=6,y(0)=1]];
```

$$ics := [[x(0)=8, y(0)=2], [x(0)=2, y(0)=8], [x(0)=2, y(0)=2], [x(0)=8, y(0)=6], [x(0)=1, y(0)=4], [x(0)=3, y(0)=9], [x(0)=6, y(0)=1]] \quad (1)$$

```
> phaseportrait([diff(x(t),t) = 14*x(t) - 2*x(t)^2 - x(t)*y(t),
                 diff(y(t),t) = 16*y(t) - 2*y(t)^2 - x(t)*y(t)],
                [x(t),y(t)], t=0..2,ics
                ,
                stepsize=1/100, x=-1..10,y=-1..10,
                linecolor=black, dirgrid=[30,30]);
>
```




```
>
```

Linearization around the equilibrium (4,6)

```
> with(LinearAlgebra): with(plots):
> A:=Matrix(2,2,[-8,-4,-6,-12]);
```

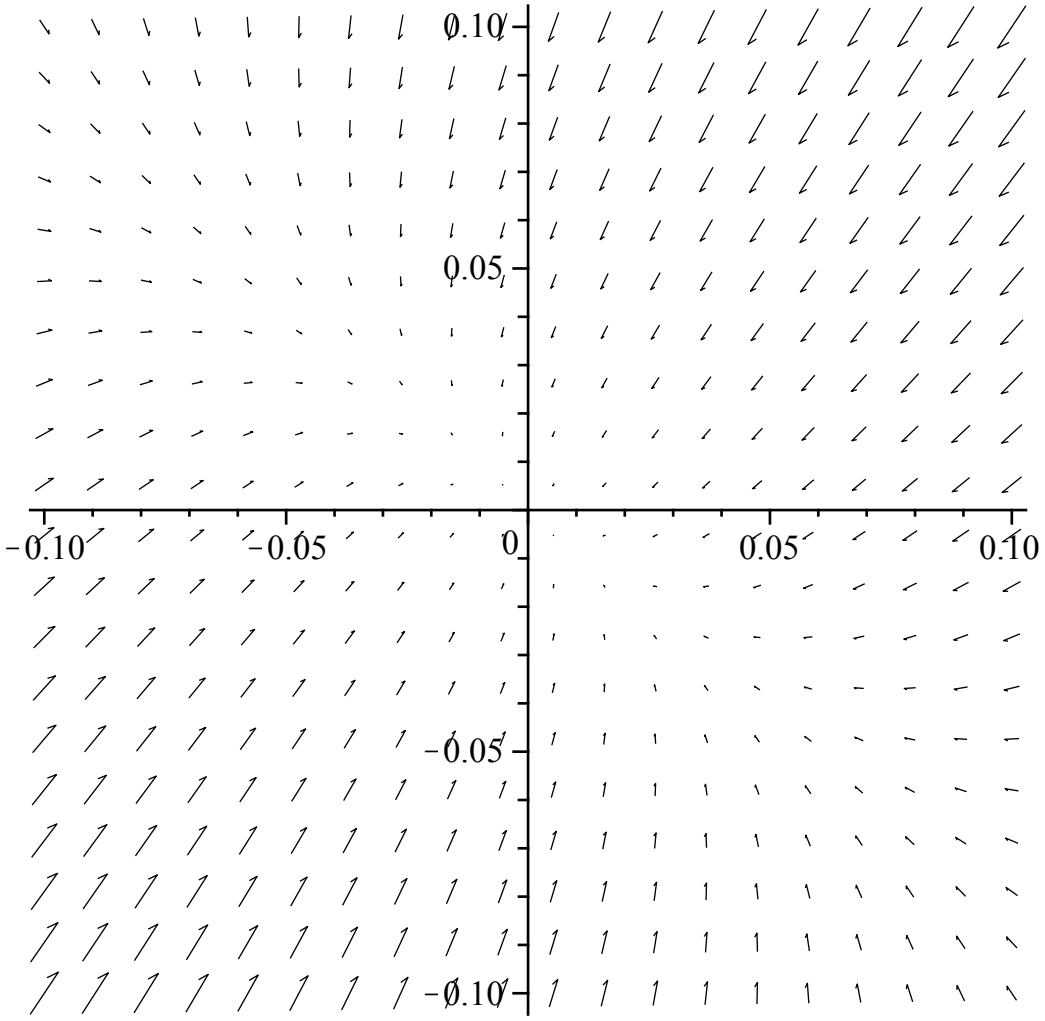
(2)

$$A := \begin{bmatrix} -8 & -4 \\ -6 & -12 \end{bmatrix} \quad (2)$$

```
> evalf(Eigenvectors(A));
```

$$\begin{bmatrix} -4.7084974 \\ -15.291503 \end{bmatrix}, \begin{bmatrix} -1.2152504 & 0.54858376 \\ 1. & 1. \end{bmatrix} \quad (3)$$

```
> fieldplot([-8*u-4*v,-6*u-12*v], u =-0.1..0.1,v=-0.1..0.1,color=
  black);
```




```
>
```