a)

In[12]:=
```
fixpoints = Solve[{μ x + y - x^2 == 0, -x + μ y + 2 x^2 == 0}, {x, y}]
```

$$\left\{\{x \to 0,\ y \to 0\},\ \left\{x \to \frac{1+\mu^2}{2+\mu},\ y \to \frac{1-2\mu+\mu^2-2\mu^3}{(2+\mu)^2}\right\}\right\}$$

```
(*Trial and error we check for stability and homoclinic bif. occurs at μ=0.066*)
```

b)

c)

In[9]:=
```
solution =
  DSolve[{x'[t] == u x[t], y'[t] == s y[t], x[0] == γ, y[0] == 1}, {x[t], y[t]}, t];
Solve[(x[t] /. Part[solution, 1, 1]) == 1, t]
```

$$\left\{\left\{t \to \frac{2\,i\,\pi\,c_1 + \text{Log}\left[\frac{1}{\gamma}\right]}{u} \text{ if } c_1 \in \mathbb{Z}\right\}\right\}$$

```
(*t=log(1/γ)/u*)
```

d)

In[83]:=
```
bifx = (1 + μ^2)/(2 + μ);
J = {{μ - 2 bifx, 1}, {-1 + 4 bifx, μ}};
ev = Eigenvalues[J];
Part[ev, 2]
```

Out[86]=
$$\frac{-1+2\mu+\sqrt{5+9\mu^2+4\mu^3+\mu^4}}{2+\mu}$$