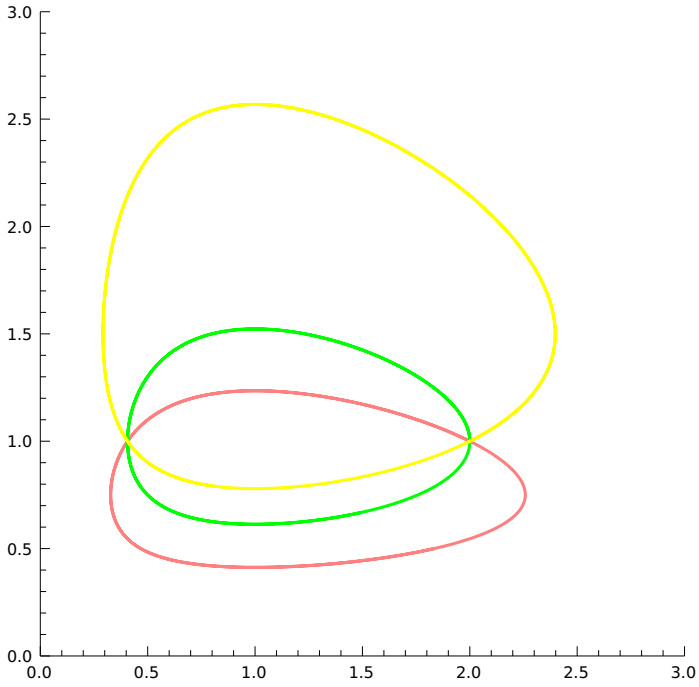
In[1]:=

```
x = .
y = .
{a, c, d} = {3, 1, 1};
colors = {Yellow, Green, Pink};
```

In[5]:=

```
plt = {};
For[b = 4, b > 1, b--,
  eq1[t_] := x'[t] == x[t] * (a - b * y[t]);
  eq2[t_] := y'[t] == y[t] * (-c + d * x[t]);
  sol =
   NDSolve[{eq1[t], eq2[t], x[0] == 2, y[0] == 1}, {x, y}, {t, 0, 7}, MaxSteps → 3000];
  plt = Append[plt, ParametricPlot[Evaluate[{x[t], y[t]} /. sol],
     {t, 0, 7}, PlotRange → {{0, 3}, {0, 3}}, PlotStyle → colors[[b - 1]]]]
]
Show[plt]
```

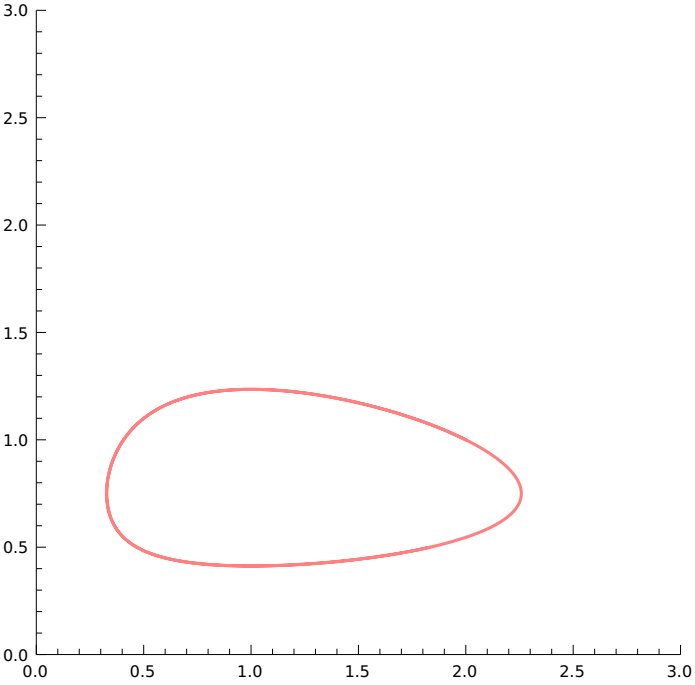
Out[7]=



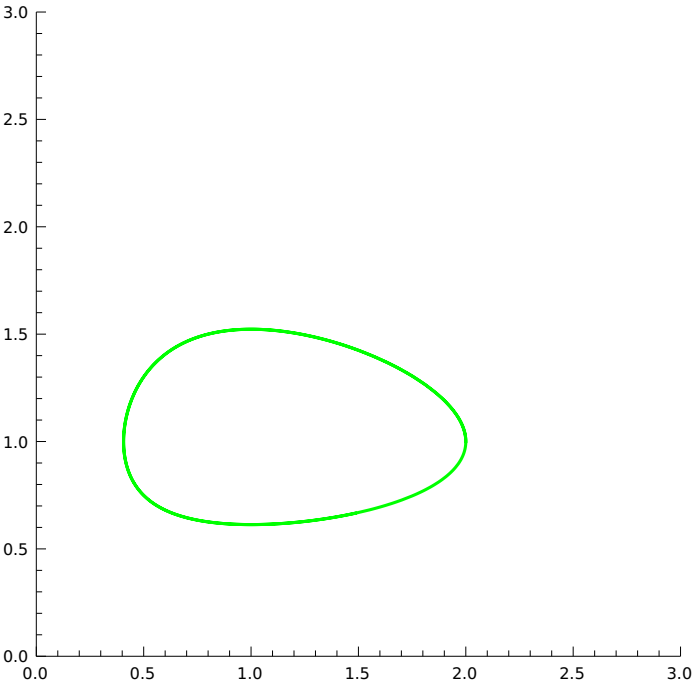
In[8]:=

```
Show[plt[[1]]]
Show[plt[[2]]]
Show[plt[[3]]]
```

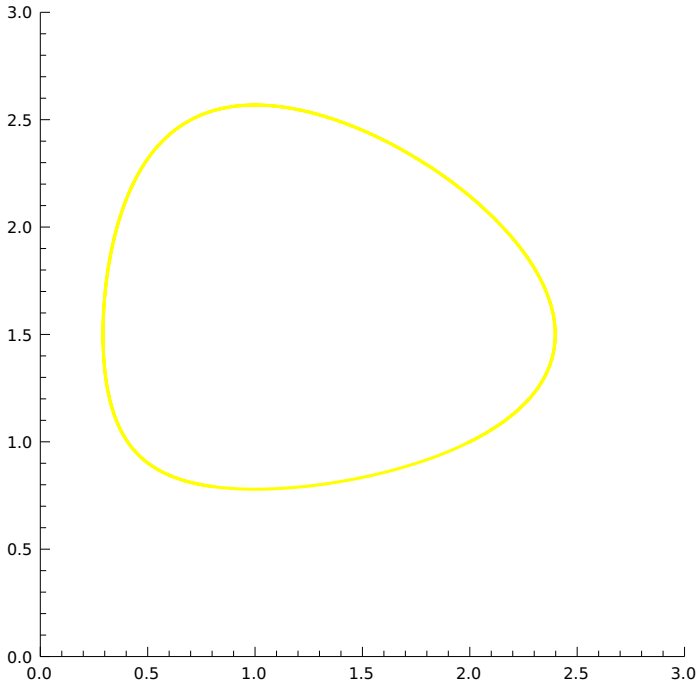
Out[8]=


3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0

Out[9]=


3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0

Out[10]=

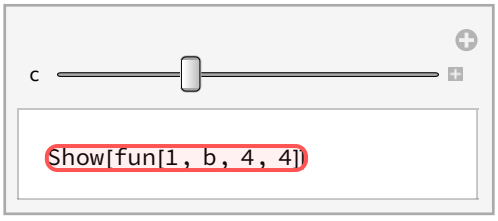


In[11]:=

```
(*Manipulate[Show[interfunc[]]]*)
fun[aa_, bb_, cc_, dd_] := Module[{a = aa, b = bb, c = cc, d = dd},
  {plt = {}};
For[b = 4, b > 1, b--,
  eq1[t_] := x'[t] == x[t] * (a - b * y[t]);
  eq2[t_] := y'[t] == y[t] * (-c + d * x[t]);
  sol =
      NDSolve[{eq1[t], eq2[t], x[0] == 2, y[0] == 1}, {x, y}, {t, 0, 7}, MaxSteps → 3000];
  plt = Append[plt, ParametricPlot[Evaluate[{x[t], y[t]} /. sol],
        {t, 0, 7}, PlotRange → {{0, 3}, {0, 3}}]];
 Return[plt]
];
```

```
c =.
Manipulate[Show[fun[1, b, c, 4]], {c, 1, 10, 1}]
```

Out[13]=



In[14]:=

In[15]:=

In[16]:=

In[17]:=

```
tmax := 1.41
alpha := Pi / 4
v0 := 10
k := 0.01
g := 9.81

sol = NDSolve[
 {
   y1'[t] == y2[t],
   y2'[t] == -k * y2[t] * Sqrt[y2[t] ^ 2 + y4[t] ^ 2],
   y3'[t] == y4[t],
   y4'[t] == -k * y4[t] * Sqrt[y2[t] ^ 2 + y4[t] ^ 2] - g,
   y1[0] == 0,
   y2[0] == v0 * Cos[alpha],
   y3[0] == 0,
   y4[0] == v0 * Sin[alpha]
 },
 {y1, y2, y3, y4},
 {t, 0, tmax},
 MaxSteps → 10 000
];

dataset = Table[
 {y1[t], y3[t]} /. sol[[1]],
 {t, 0, tmax, 0.001}
];

ListPlot[dataset]
```

Out[24]=