```
k = 1;
tend = 300;
x0 = 2.5; y0 = 2.5;
x =.; y =.;

Sol = NDSolve[{D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] ==
      k * (x[t] * y[t] * y[t] - y[t]), x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
```

Out[ ]= $\frac{1}{1+t}$

```
In[9585]:= P1 = ParametricPlot[{Evaluate[x[t] /. First[Sol]], Evaluate[y[t] /. First[Sol]]},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False,
    PlotRange → {{0, 5.5}, {0, 5.5}}, PlotStyle → Black,
    FrameLabel → {Style["Aα", FontFamily → "Times New Roman", FontSlant → Italic,
       FontSize → 21, FontColor → Black], Style["Cα", FontFamily →
        "Times New Roman", FontSlant → Italic, FontSize → 21, FontColor → Black]},
    RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}},
    Epilog → {Inset[Graphics[{Black, Text[Style[
           " Αρχικές συνθήκες ", 21, FontFamily → "MS Serif"]]}], {5, 6.1}],
      Inset[Graphics[{Black,
         Text[Style[" Θ. ασ. ευστ. σ.ι. ", 21, FontFamily → "MS Serif"]]}],
       {4.9, 5.7}], {Green, Text[Style["✱", 20], {3.5, 5.7}]},
      {Green, Text[Style["✱", 25], {1, 1}]}}];
G0 = Graphics[{PointSize[0.02], Blue, Point[{3.5, 6.1}]}];
G1 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];


x0 = 0.5; y0 = 0.05;
Sol2 = NDSolve[
   {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
    x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P2 =
  ParametricPlot[{Evaluate[x[t] /. First[Sol2]], Evaluate[y[t] /. First[Sol2]]},
   {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G2 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];

x0 = 1.5; y0 = 0.3;
Sol3 = NDSolve[
   {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
    x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P3 =
  ParametricPlot[{Evaluate[x[t] /. First[Sol3]], Evaluate[y[t] /. First[Sol3]]},
   {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G3 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];

x0 = 0.5; y0 = 0.2;
```

```
Sol4 = NDSolve[
    {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
     x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P4 =
  ParametricPlot[{Evaluate[x[t] /. First[Sol3]], Evaluate[y[t] /. First[Sol3]]},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G4 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];


x0 = 0.5; y0 = 0.2;
Sol5 = NDSolve[
    {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
     x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P5 =
  ParametricPlot[{Evaluate[x[t] /. First[Sol5]], Evaluate[y[t] /. First[Sol5]]},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G5 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];

x0 = 5.5; y0 = k / (k * x0 + 1);
Sol6 = NDSolve[
    {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
     x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P6 =
  ParametricPlot[{Evaluate[x[t] /. First[Sol6]], Evaluate[y[t] /. First[Sol6]]},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G6 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];

x0 = 4; y0 = 0.15;
Sol7 = NDSolve[
    {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
     x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P7 =
  ParametricPlot[{Evaluate[x[t] /. First[Sol7]], Evaluate[y[t] /. First[Sol7]]},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G7 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];

x0 = 1.8; y0 = k / (k * x0 + 1) + 0.1;
Sol8 = NDSolve[
    {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
     x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P8 =
  ParametricPlot[{Evaluate[x[t] /. First[Sol8]], Evaluate[y[t] /. First[Sol8]]},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G8 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];

x0 = 3; y0 = k / (k * x0 + 1);
Sol9 = NDSolve[
```

```
    {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
     x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P9 =
  ParametricPlot[{Evaluate[x[t] /. First[Sol9]], Evaluate[y[t] /. First[Sol9]]},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G9 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];

x0 = 8; y0 = 0.12;
Sol10 = NDSolve[
    {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
     x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P10 = ParametricPlot[
    {Evaluate[x[t] /. First[Sol10]], Evaluate[y[t] /. First[Sol10]]},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G10 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];

x0 = 5.5; y0 = 0.2;
Sol11 = NDSolve[
    {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
     x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P11 = ParametricPlot[
    {Evaluate[x[t] /. First[Sol11]], Evaluate[y[t] /. First[Sol11]]},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G11 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];

x0 = 3; y0 = 0.35;
Sol12 = NDSolve[
    {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
     x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P12 = ParametricPlot[
    {Evaluate[x[t] /. First[Sol12]], Evaluate[y[t] /. First[Sol12]]},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G12 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];



x0 = 0.05; y0 = 0.49;
Sol13 = NDSolve[
    {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
     x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P13 = ParametricPlot[
    {Evaluate[x[t] /. First[Sol13]], Evaluate[y[t] /. First[Sol13]]},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G13 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];


x0 = 7; y0 = 0.15;
```

```
Sol14 = NDSolve[
   {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
    x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P14 = ParametricPlot[
   {Evaluate[x[t] /. First[Sol14]], Evaluate[y[t] /. First[Sol14]]},
   {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G14 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];


x0 = 2; y0 = 0.001;
Sol15 = NDSolve[
   {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
    x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P15 = ParametricPlot[
   {Evaluate[x[t] /. First[Sol15]], Evaluate[y[t] /. First[Sol15]]},
   {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G15 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];


x0 = 5.5; y0 = 0.001;
Sol16 = NDSolve[
   {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
    x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P16 = ParametricPlot[
   {Evaluate[x[t] /. First[Sol16]], Evaluate[y[t] /. First[Sol16]]},
   {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G16 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];

x0 = 1.3; y0 = 0.5;
Sol17 = NDSolve[
   {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
    x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P17 = ParametricPlot[
   {Evaluate[x[t] /. First[Sol17]], Evaluate[y[t] /. First[Sol17]]},
   {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G17 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];

x0 = 1.1; y0 = 0.53;
Sol18 = NDSolve[
   {D[x[t], t] == 1 - x[t] * y[t] * y[t], D[y[t], t] == k * (x[t] * y[t] * y[t] - y[t]),
    x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
P18 = ParametricPlot[
   {Evaluate[x[t] /. First[Sol18]], Evaluate[y[t] /. First[Sol18]]},
   {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
G18 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];
```

```
Por = ParametricPlot[{1 / y - x - 1 / k == 0},
    {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Red];

f[t_] := k / (k * t + 1)
Por = Plot[f[t], {t, 0, tend}, Filling → Axis,
    PlotRange → All, PlotStyle → {Orange, Thickness[0.008]},
    FillingStyle → Directive[Gray, Opacity[.2]]];
 (*Epilog→Inset[Column[{LineLegend[{Black,DotDashed},{"S_gen"},
       LabelStyle→{FontFamily→"Times New Roman",FontSize→16,
         FontSlant→Italic}]}],Scaled[{0.5,0.7}]];*)

Show[P1, P2, P3, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14,
 P15, P16, P17, P18, G0, G1, G2, G3, G5, G6, G7, G8, G9, G10, G11,
 G12, G13, G14, G15, G16, G17, G18, Por, ImageSize → {450, 450},
 AspectRatio → Full, PlotLabel → None, LabelStyle → {21, GrayLevel[0]},
 FrameTicks → {{{0, 0.1, 0.2, 0.3, 0.4, 0.5, 1, 2, 3, 4, 5, 6}, None},
   {{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, None}}, PlotRange → {{0, 10}, {0, 0.55}}]
```

Out[ ]=