```
In[3863]:=  ks = 0.5;
            kappa = (1 + ks) * (1 + ks) / (1 - ks)
            k = 6;
            tend = 3;
            x0 = 2.2; y0 = 2;
            x =.; y =.;
            Sol = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
                D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * y[t]),
                x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];

Out[3864]=  4.5

In[3870]:=  P1 = ParametricPlot[{Evaluate[x[t] /. First[Sol]], Evaluate[y[t] /. First[Sol]]},
                {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
            G1 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];


            x0 = 0.2; y0 = 4.8;
            Sol2 = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
                D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * 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 = 0.5; y0 = 0.5;
            Sol3 = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
                D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * 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 = 3.1; y0 = 0.2;
            Sol4 = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
                D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * y[t]),
                x[0] == x0, y[0] == y0}, {x, y}, {t, 0, tend}];
            P4 =
              ParametricPlot[{Evaluate[x[t] /. First[Sol4]], Evaluate[y[t] /. First[Sol4]]},
                {t, 0, tend}, PlotPoints → 2000, Mesh → False, PlotStyle → Black];
            G4 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];


            x0 = 0.8; y0 = 12;
            Sol5 = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
                D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * y[t]),
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      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 = 1; y0 = 3.5;
Sol6 = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
    D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * 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 = 3; y0 = 0.5;
Sol7 = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
    D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * 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 = 1.6; y0 = 7;
Sol8 = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
    D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * 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 = 0.2; y0 = 0.2;
Sol9 = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
    D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * 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 = 0.8; y0 = 1;
Sol10 = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
    D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * 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 = 0.4; y0 = 1;
Sol12 = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
    D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * 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 = 0.617; y0 = 1;
Sol11 = NDSolve[{D[x[t], t] == 1 + ks - ks * x[t] - x[t] * y[t] * y[t],
    D[y[t], t] == (k / (1 + ks)) * (x[t] * y[t] * y[t] + ks * x[t] - (1 + ks) * 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 → Green];
G11 = Graphics[{PointSize[0.02], Blue, Point[{x0, y0}]}];



pol = Polygon[{{0, 0}, {1 + 1 / ks, 0}, {1 + 1 / ks, 1}, {0, 1 + k / ks}}];
Gp = Graphics[{Opacity[0.2], Gray, pol}, PlotRange → {{0, 5.5}, {0, 5.5}},
   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}},
   FrameTicks → {{{0, 1, 2, 3, 4, 5}, None}, {{0, 1, 2, 3, 4, 5}, None}},
   Epilog → {Inset[Graphics[{Black, Text[Style[" Αρχικές συνθήκες ",
         21, FontFamily → "MS Serif"]]}], {3.1, 13.6}],
     Inset[Graphics[
       {Black, Text[Style[" Θ. ασταθές σ.ι. ", 21, FontFamily → "MS Serif"]]}],
       {2.95, 12.3}], {Red, Text[Style["*", 20], {2, 12.3}]}},
     {Red, Text[Style["*", 20], {1, 1}]}}];
G0 = Graphics[{PointSize[0.02], Blue, Point[{2, 13.6}]}];
Gp1 = Graphics[{PointSize[0.02], Gray, Point[{0, 0}]}];
Gp2 = Graphics[{PointSize[0.02], Gray, Point[{1 + 1 / ks, 0}]}];
Gp3 = Graphics[{PointSize[0.02], Gray, Point[{1 + 1 / ks, 1}]}];
Gp4 = Graphics[{PointSize[0.02], Gray, Point[{0, 1 + k / ks}]}];
Gp5 = Graphics[{Gray, Thickness[0.007],
    Line[{{0, 0}, {1 + 1 / ks, 0}, {1 + 1 / ks, 1}, {0, 1 + k / ks}, {0, 0}}]}];
(*G55=Graphics[{{White,Disk[{1,1},0.5]}}];*)
```

```
G55 = Graphics[{Gray, Ellipsoid[{0.99, 1.05}, {0.14, 0.39}]}];
G56 = Graphics[{White, Ellipsoid[{0.99, 1.05}, {0.11, 0.33}]}];
```

```
Show[Gp, Gp1, Gp2, Gp3, Gp4, Gp5, G55, G56, P1, P2, P3, P4, P5, P6, P7,
 P8, P9, P10, P11, P12, G0, G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G11,
 G12, ImageSize → {450, 450}, AspectRatio → Full, PlotLabel → None,
 LabelStyle → {21, GrayLevel[0]}, PlotRange → {{0, 4}, {0, 14}},
 FrameTicks → {{0, 2, 4, 6, 8, 10, 12, 14}, None}, {{0, 1, 2, 3, 4, 5}, None}}]
```

Out[3926]=