La successione di Fibonacci

In[1]:=

```
Fib[0] = 1;
Fib[1] = 1;
Fib[m_] := Fib[m] = Fib[m-1] + Fib[m-2]
```

In[4]:=

```
?Fib
Global`Fib
Fib[0] = 1

Fib[1] = 1

Fib[m_] :=
  Fib[m] = Fib[m - 1] + Fib[m - 2]
```

In[5]:=

```
Fib[5]
```

Out[5]=

```
8
```

In[6]:=

```
?Fib
Global`Fib
Fib[0] = 1

Fib[1] = 1

Fib[2] = 2

Fib[3] = 3

Fib[4] = 5

Fib[5] = 8

Fib[m_] :=
  Fib[m] = Fib[m - 1] + Fib[m - 2]
```

In[7]:=

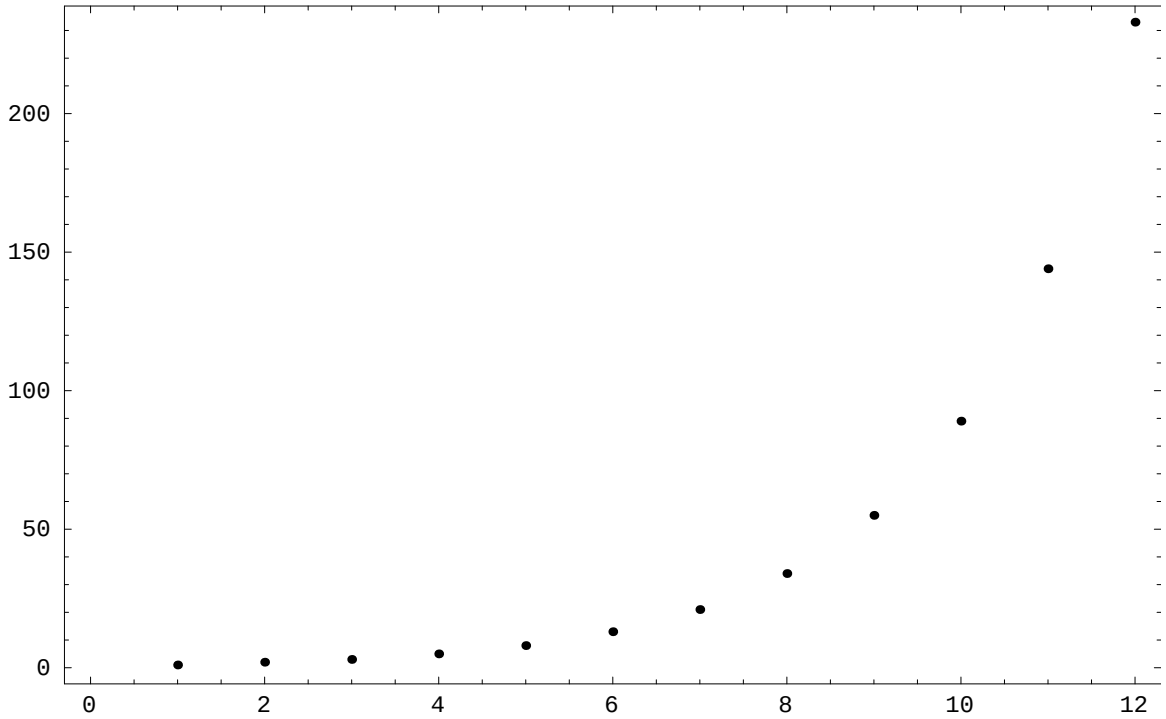
```
Table[Fib[m],{m,1,12}]
```

Out[7]=

```
{1, 2, 3, 5, 8, 13, 21, 34, 55, 89,
  144, 233}
```

In[8]:=

```
g1 = ListPlot[%,Axes->False,Frame->True]
```



Out[8]=

```
-Graphics-
```

In[9]:=

```
Table[Fib[m]/Fib[m-1] - 1,{m,1,24}]
```

Out[9]=

$$\left\{0, 1, \frac{1}{2}, \frac{2}{3}, \frac{3}{5}, \frac{5}{8}, \frac{8}{13}, \frac{13}{21}, \frac{21}{34}, \frac{34}{55}, \frac{55}{89}, \frac{89}{144}, \frac{144}{233}, \frac{233}{377}, \frac{377}{610}, \frac{610}{987}, \frac{987}{1597}, \frac{1597}{2584}, \frac{2584}{4181}, \frac{4181}{6765}, \frac{6765}{10946}, \frac{10946}{17711}, \frac{17711}{28657}, \frac{28657}{46368}\right\}$$

In[10]:=

```
N[%,8]
```

Out[10]=

```
{0, 1., 0.5, 0.66666667, 0.6, 0.625,
  0.61538462, 0.61904762, 0.61764706,
  0.61818182, 0.61797753, 0.61805556,
  0.61802575, 0.61803714, 0.61803279,
  0.61803445, 0.61803381, 0.61803406,
  0.61803396, 0.618034, 0.61803399,
  0.61803399, 0.61803399, 0.61803399}
```

In[11]:=

```
N[(1 + Sqrt[5])/2 - 1,8]
```

Out[11]=

```
0.61803399
```

Modello di crescita a tasso costante

```
(* i = popolazione iniziale,
   k = tasso di crescita *)
```

In[12]:=

```
TassoCostante[i_,k_] :=
  (Clear[p];
   p[0] = i;
   p[t_] := p[t] = (1 + k) p[t-1])
```

In[13]:=

```
TassoCostante[1,N[(1 + Sqrt[5])/2 - 1]]
```

In[14]:=

```
Table[p[t],{t,1,12}]
```

Out[14]=

```
{1.61803, 2.61803, 4.23607, 6.8541,
  11.0902, 17.9443, 29.0344, 46.9787,
  76.0132, 122.992, 199.005, 321.997}
```

In[15]:=

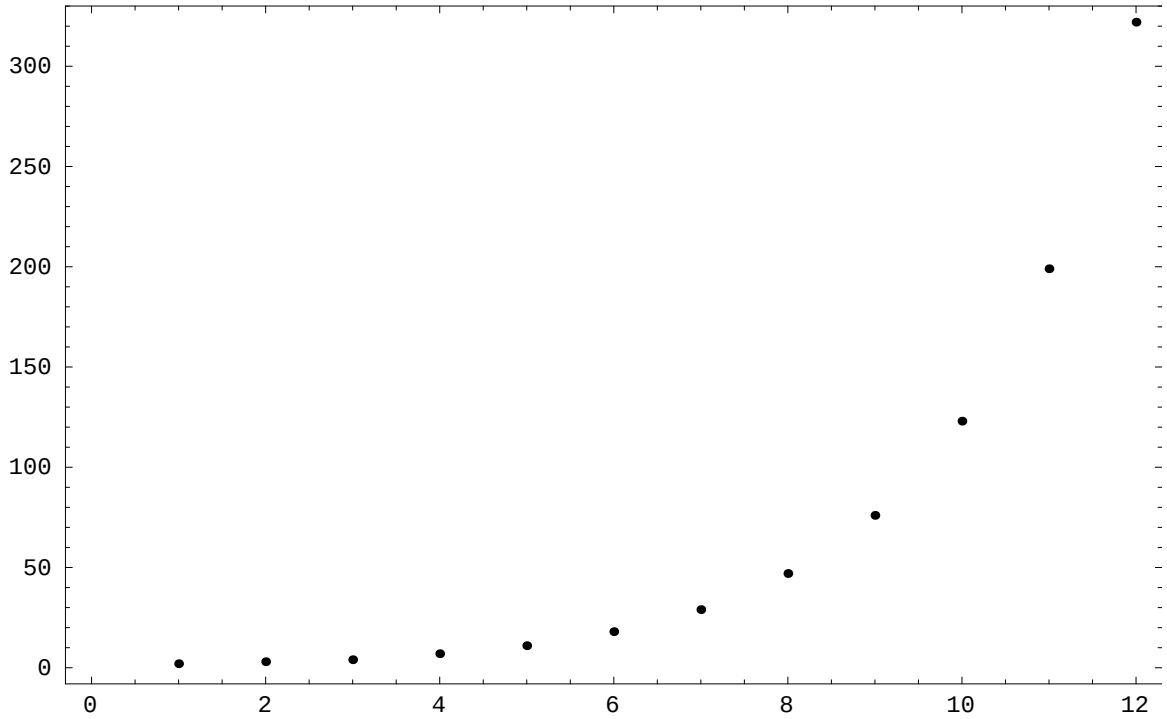
```
Round[%]
```

Out[15]=

```
{2, 3, 4, 7, 11, 18, 29, 47, 76, 123,
  199, 322}
```

In[16]:=

```
g2 = ListPlot[%,Axes->False,Frame->True]
```

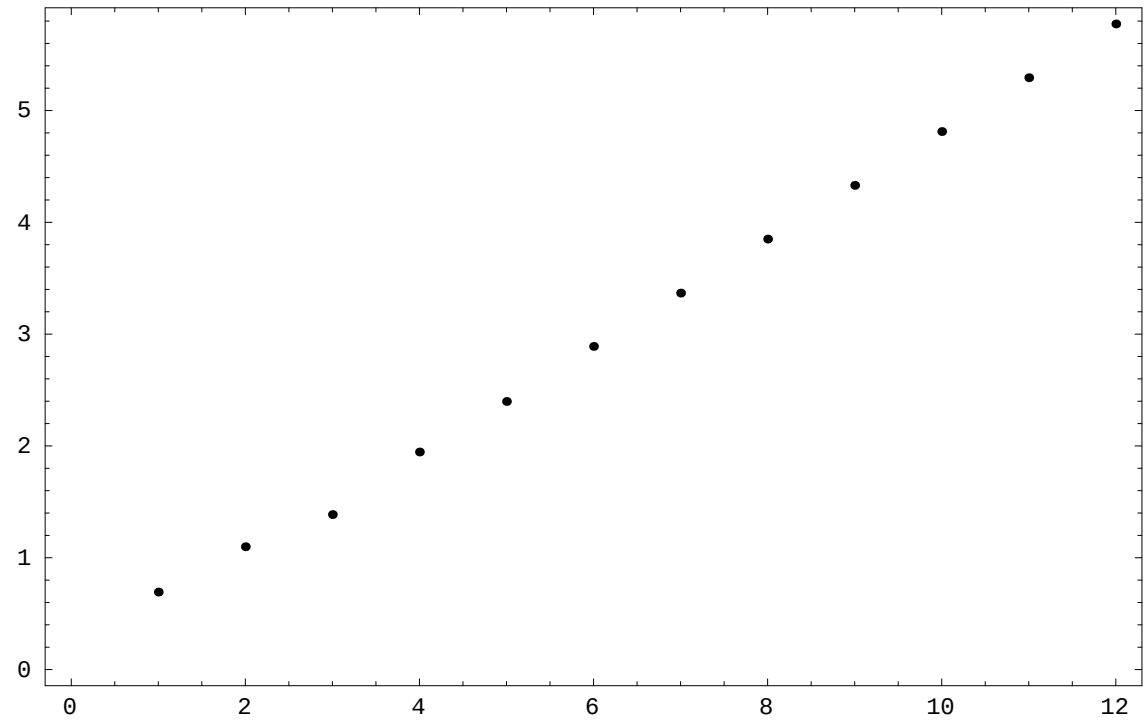


Out[16]=

-Graphics-

In[17]:=

```
ListPlot[Map[Log,%%],
         Axes->False,Frame->True]
```



Out[17]=

```
-Graphics-
```

In[18]:=

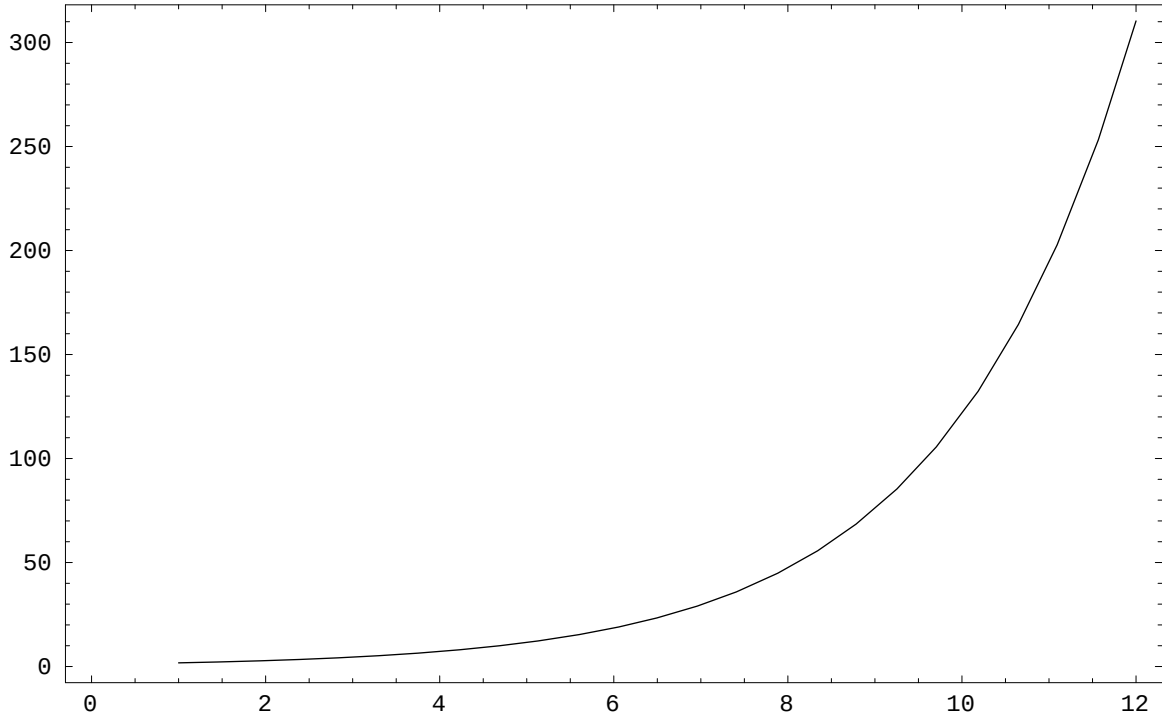
```
Fit[N[Map[Log,%%%]],{1,t},t]
```

Out[18]=

```
0.0991273 + 0.469884 t
```

In[19]:=

```
Plot[E^%,{t,1,12},
     Axes->False,Frame->True]
```

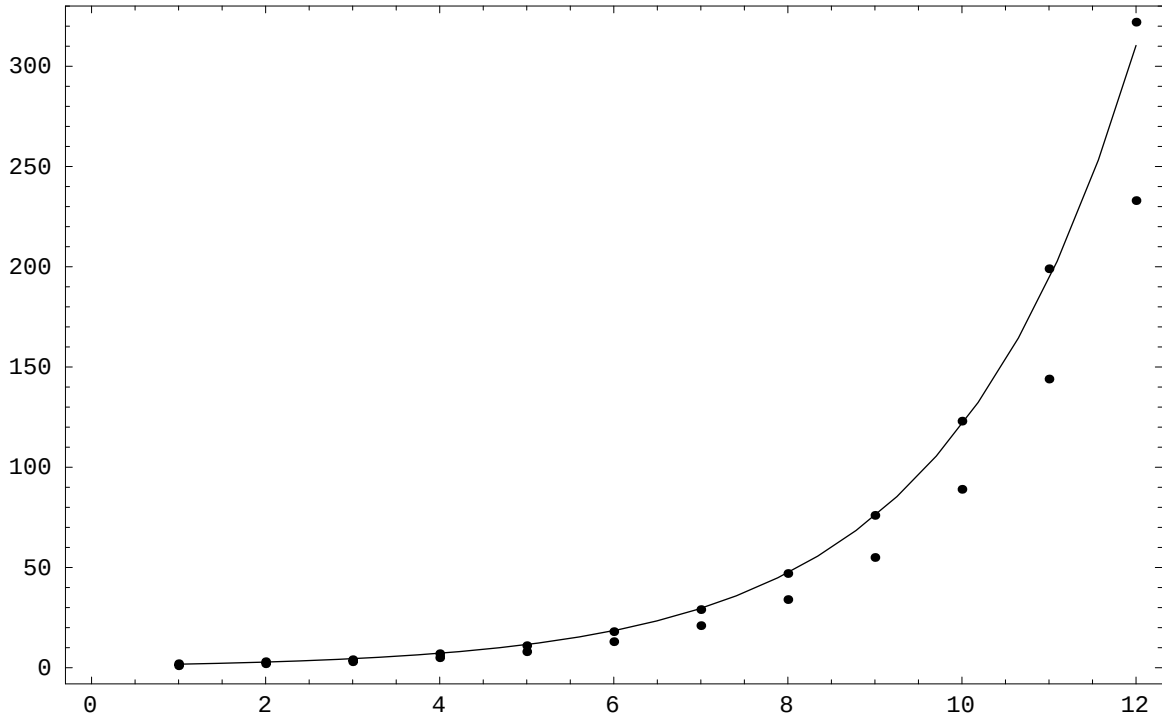


Out[19]=

-Graphics-

In[20]:=

```
Show[%,g1,g2]
```



Out[20]=

```
-Graphics-
```

In[21]:=

```
Table[ListPlot[TassoCostante[1,k];
                 Table[p[t],{t,1,12}],
        Axes->False,Frame->True,
        PlotJoined->True,
        DisplayFunction->Identity],
      {k,0.,1.,.2}]
```

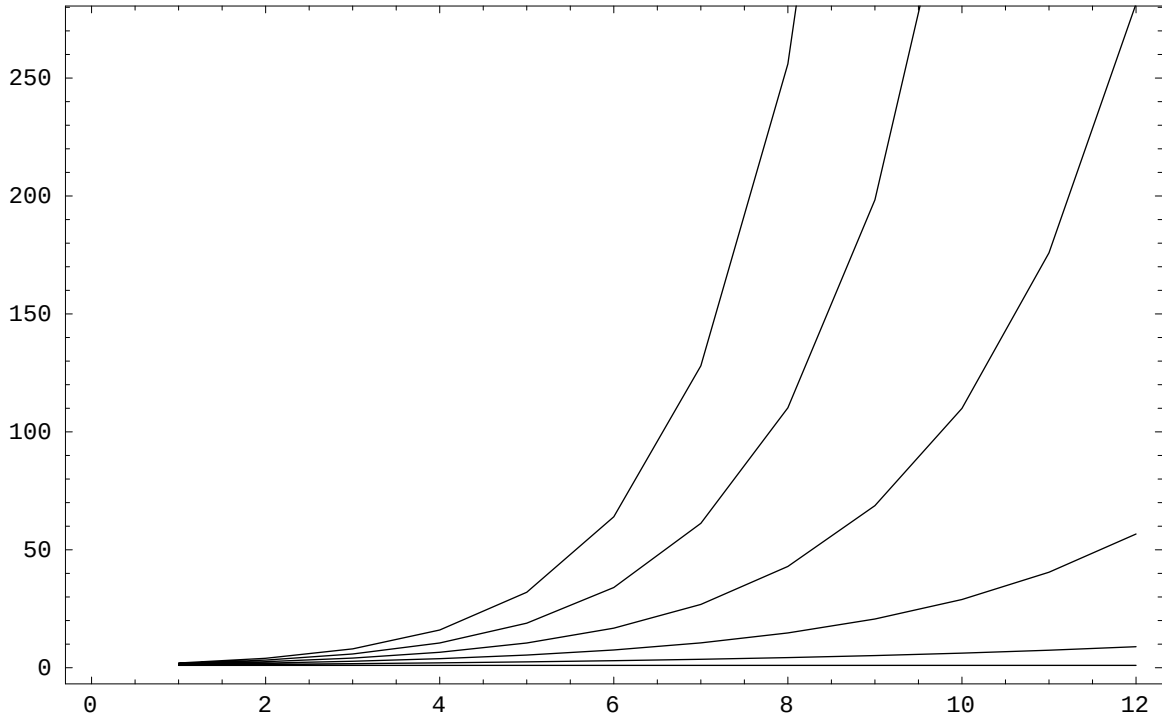
Out[21]=

```
{-Graphics-, -Graphics-, -Graphics-,

  -Graphics-, -Graphics-, -Graphics-}
```

In[22]:=

```
Show[%,DisplayFunction->$DisplayFunction]
```



Out[22]=

-Graphics-

Modello di crescita limitata

```
(* i = popolazione iniziale,
   m = popolazione ottimale
   k = tasso teorico di crescita
       senza limiti di sviluppo *)
```

In[23]:=

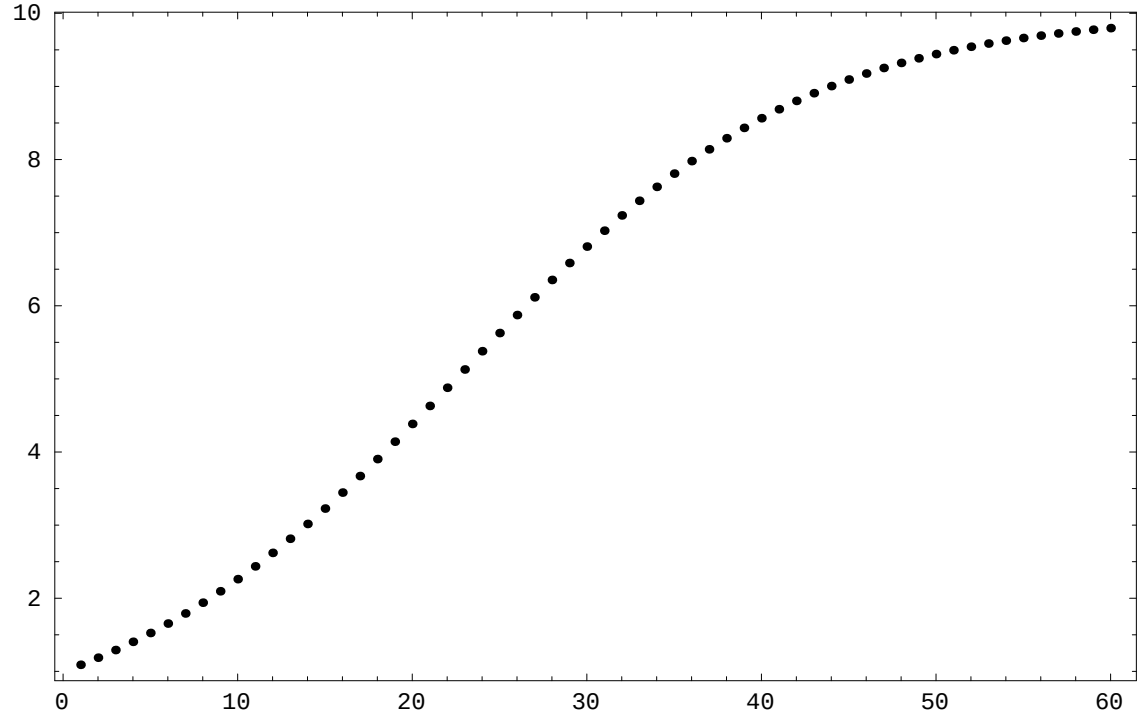
```
Verhulst[i_,m_,k_] :=
  (Clear[p];
   p[0] = i;
   p[t_] := p[t] =
     (1 + k(1 - p[t-1]/m)) p[t-1])
```

In[24]:=

```
Verhulst[1,10,.1]
```

In[25]:=

```
ListPlot[Table[p[t],{t,1,60}],
  Axes->False,Frame->True,PlotRange->All]
```



Out[25]=

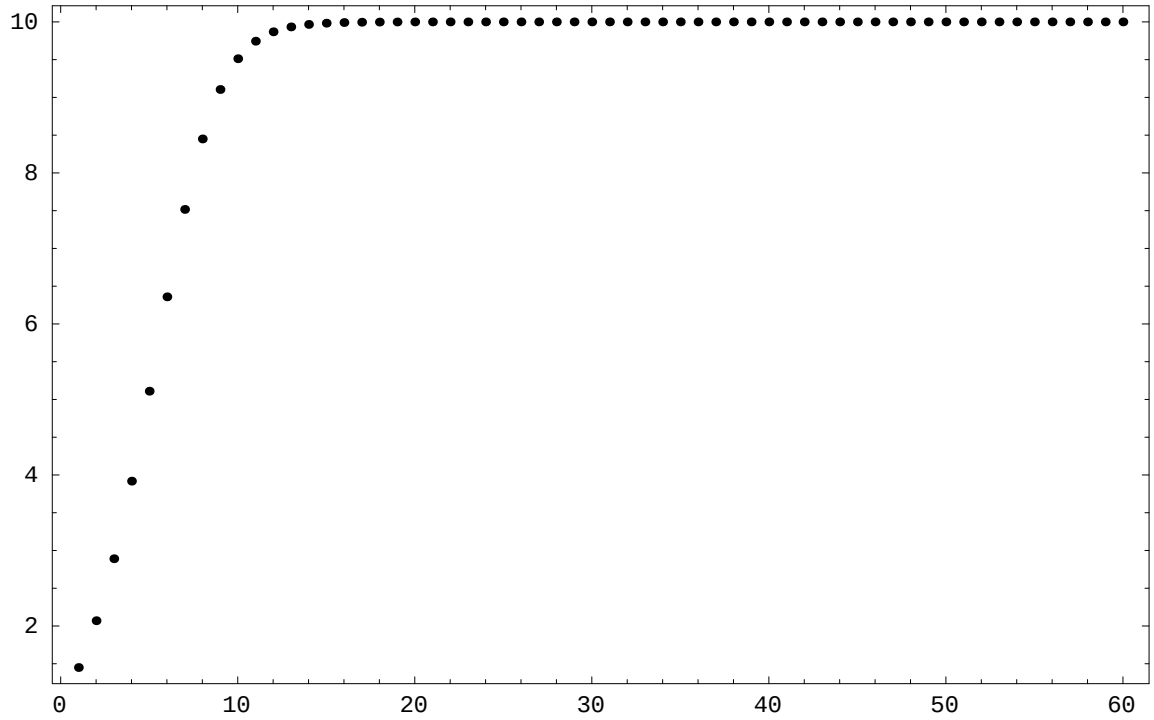
-Graphics-

In[26]:=

```
Verhulst[1,10,.5]
```

In[27]:=

```
ListPlot[Table[p[t],{t,1,60}],
  Axes->False,Frame->True,PlotRange->All]
```



Out[27]=

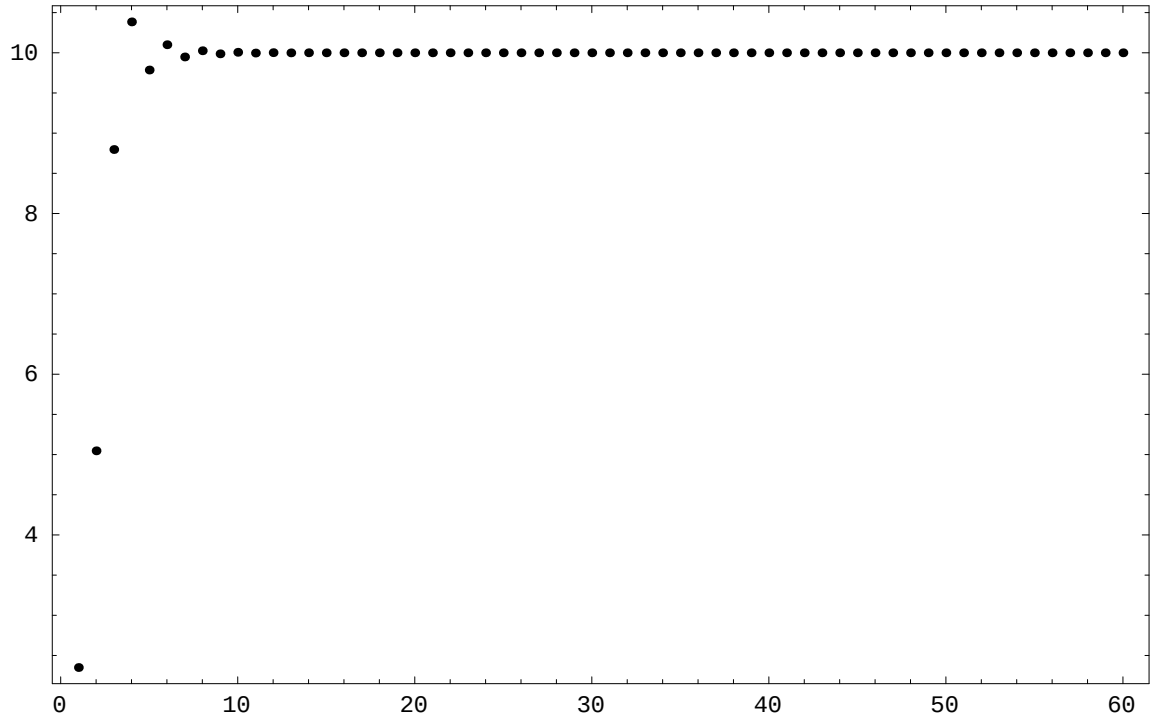
```
-Graphics-
```

In[28]:=

```
Verhulst[1,10,1.5]
```

In[29]:=

```
ListPlot[Table[p[t],{t,1,60}],
  Axes->False,Frame->True,PlotRange->All]
```



Out[29]=

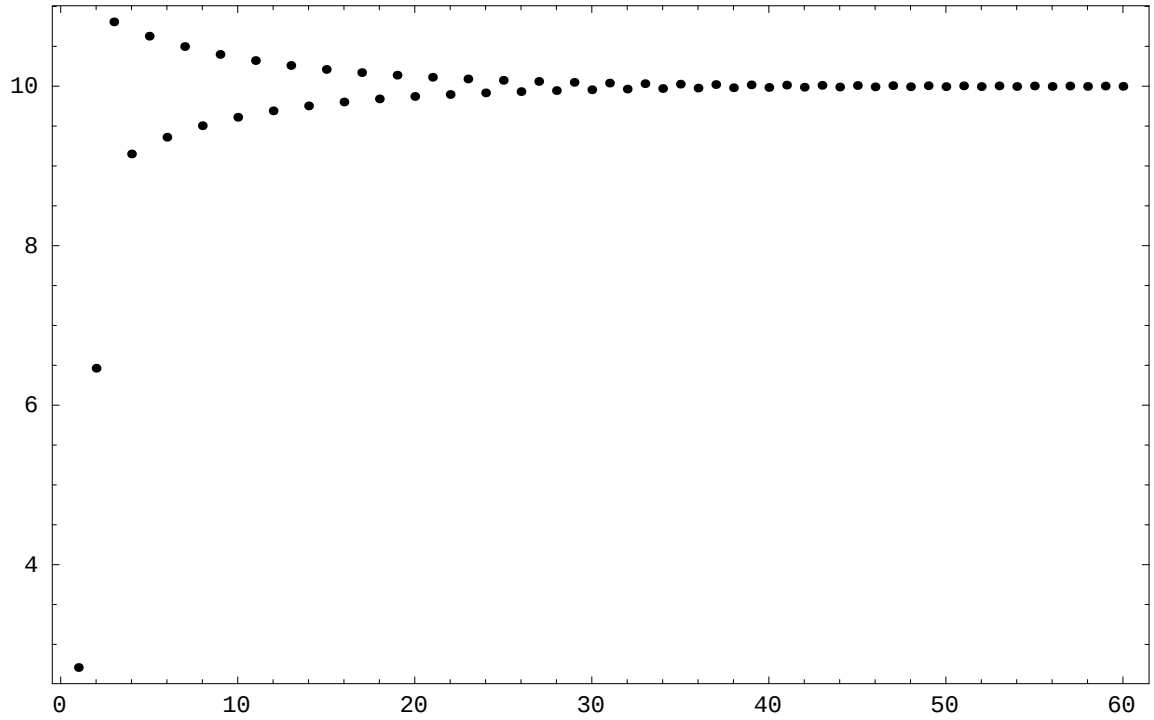
```
-Graphics-
```

In[30]:=

```
Verhulst[1,10,1.9]
```

In[31]:=

```
ListPlot[Table[p[t],{t,1,60}],
  Axes->False,Frame->True,PlotRange->All]
```



Out[31]=

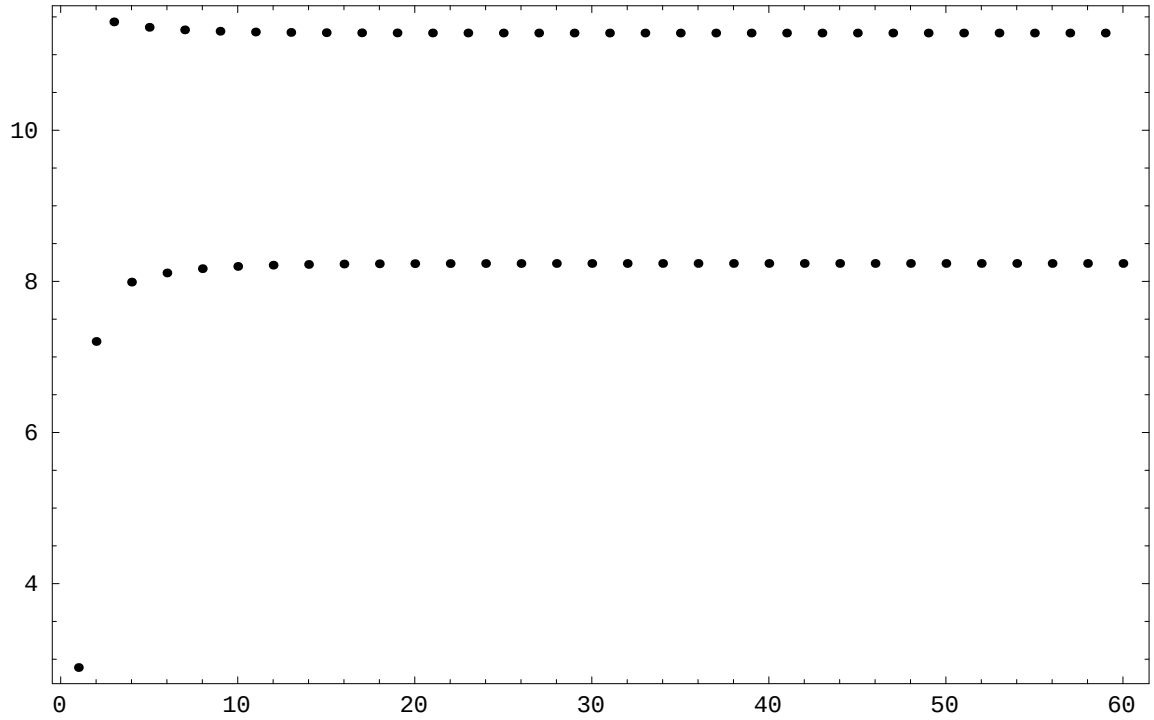
```
-Graphics-
```

In[32]:=

```
Verhulst[1,10,2.1]
```

In[33]:=

```
ListPlot[Table[p[t],{t,1,60}],
  Axes->False,Frame->True,PlotRange->All]
```



Out[33]=

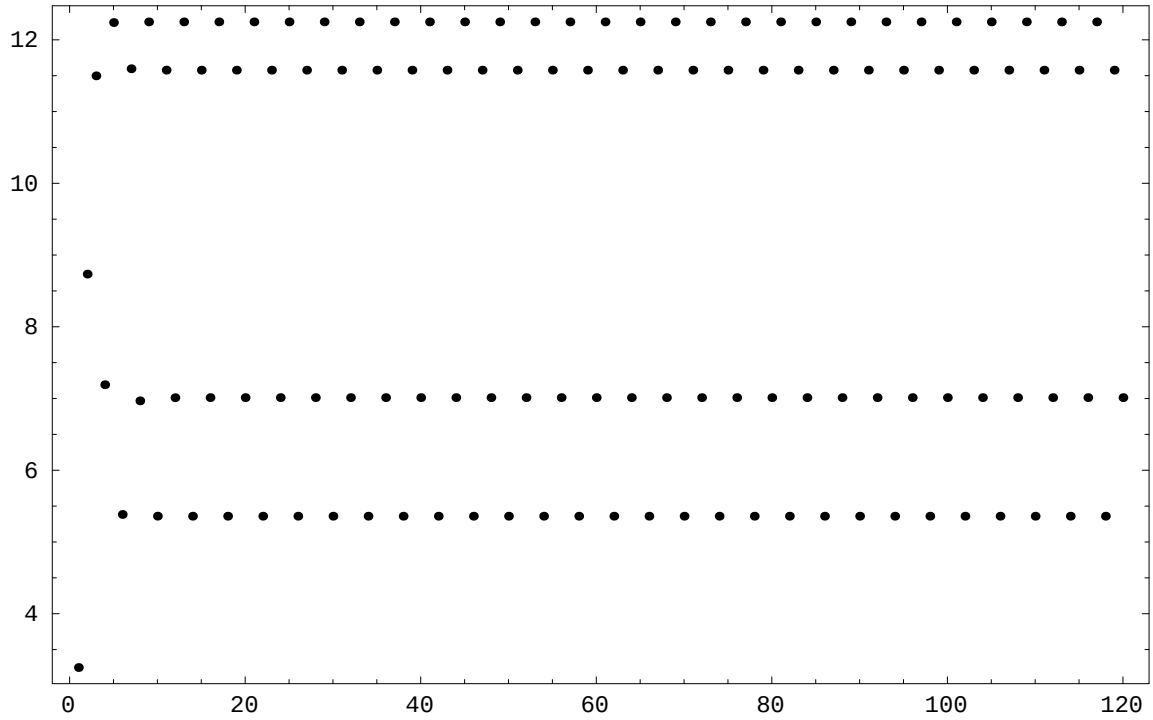
```
-Graphics-
```

In[34]:=

```
Verhulst[1,10,2.5]
```

In[35]:=

```
ListPlot[Table[p[t],{t,1,120}],
  Axes->False,Frame->True,PlotRange->All]
```



Out[35]=

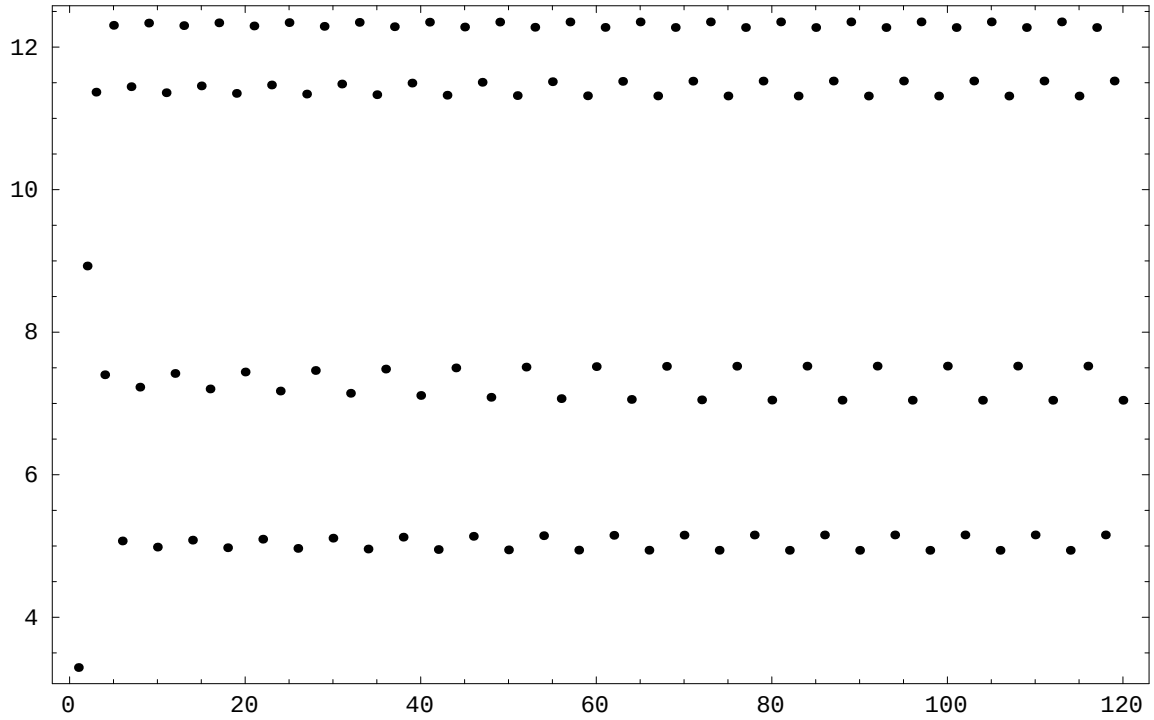
```
-Graphics-
```

In[36]:=

```
Verhulst[1,10,2.55]
```

In[37]:=

```
ListPlot[Table[p[t],{t,1,120}],
  Axes->False,Frame->True,PlotRange->All]
```



Out[37]=

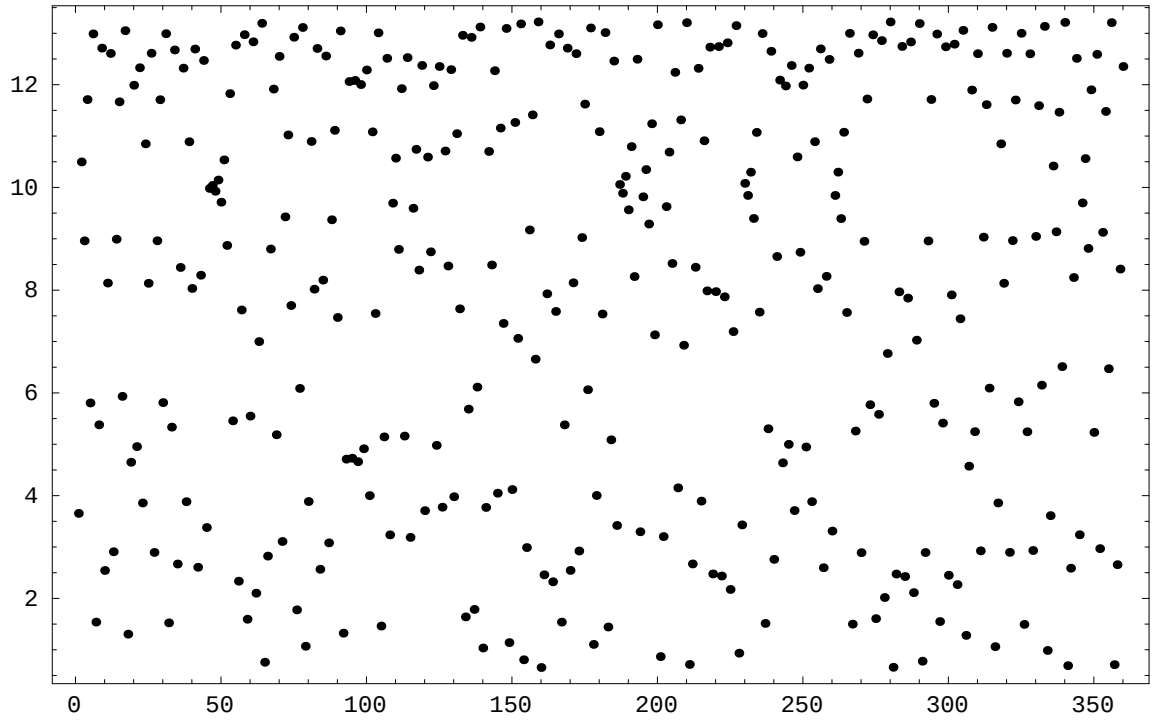
```
-Graphics-
```

In[38]:=

```
Verhulst[1,10,2.95]
```

In[39]:=

```
ListPlot[Table[p[t],{t,1,360}],
  Axes->False,Frame->True,PlotRange->All]
```



Out[39]=

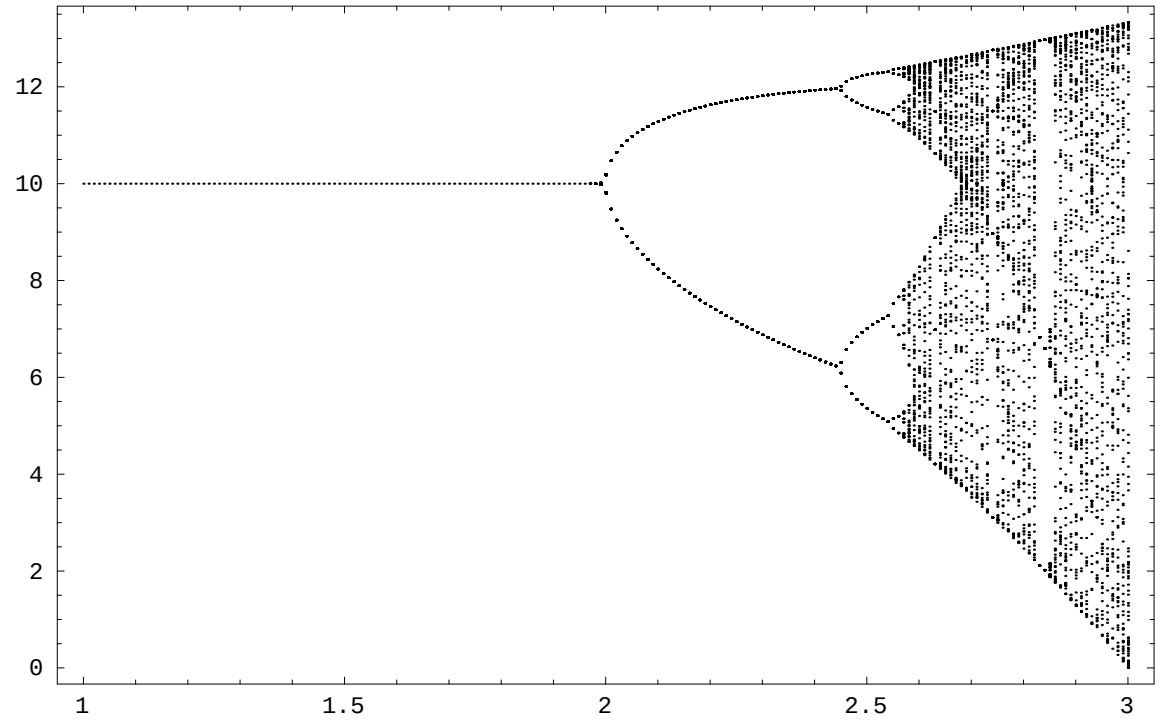
```
-Graphics-
```

In[40]:=

```
Table[Verhulst[1.,10.,k];
      Take[Table[{k,p[i]},{i,400}],-100],
      {k,1.,3.,.01}];
```

In[41]:=

```
ListPlot[Apply[Join,%],
         Axes->False,Frame->True,
         PlotStyle->{PointSize[0.002]}]
```



Out[41]=

-Graphics-

Proiezioni cartografiche

In[42]:=

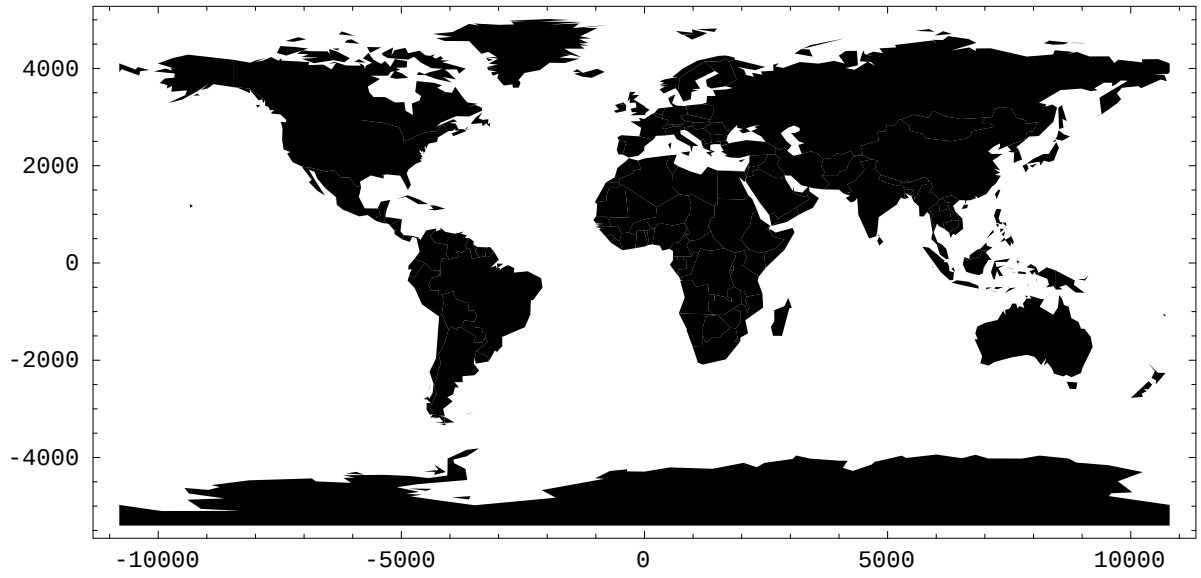
```
Planisfero = -Graphics-
```

Out[42]=

-Graphics-

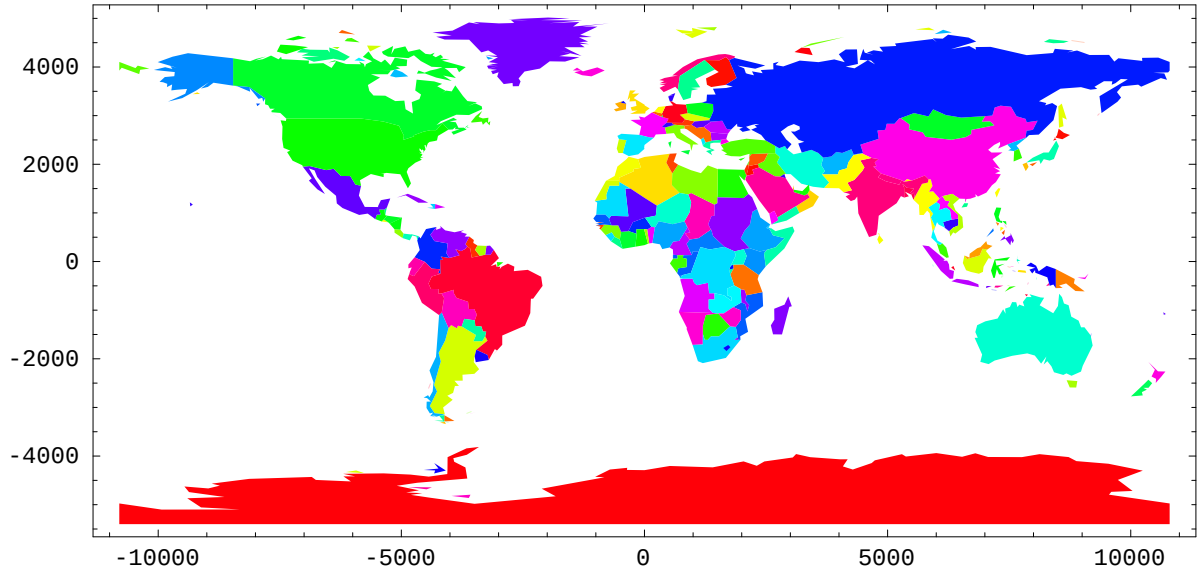
In[43]:=

```
Show[Planisfero,Frame->True];
```



In[44]:=

```
Show[% /. p_Polygon :> {Hue[Random[]],p}]
```



Out[44]=

-Graphics-

In[45]:=

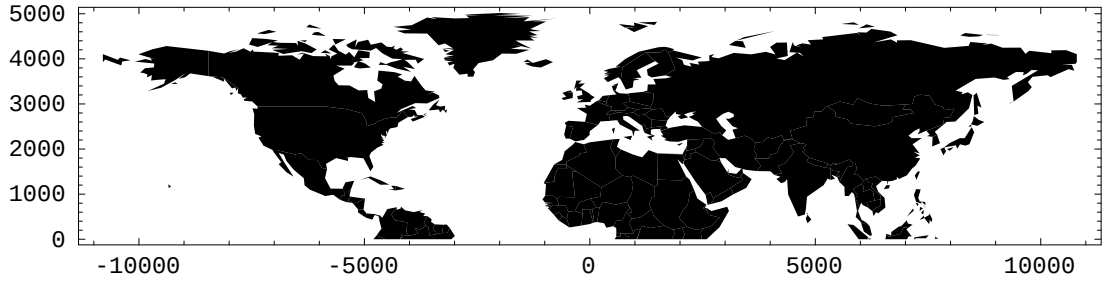
```
Emisfero = -Graphics-
```

Out[45]=

-Graphics-

In[46]:=

```
Show[Emisfero,Frame->True]
```



Out[46]=

-Graphics-

In[47]:=

```
% /. {x_?NumberQ,y_?NumberQ} :>
      {x,y} N[Degree/60]
```

Out[47]=

-Graphics-

In[48]:=

```
% /. {x_?NumberQ,y_?NumberQ} :>
      2 Tan[Pi/4 - y/2] {Cos[x],Sin[x]}
```

Out[48]=

-Graphics-

In[49]:=

```
Show[%,Frame->False,
      PlotRange->{{-2,2},{-2,2}}]
```

Out[49]=

-Graphics-

In[50]:=

```
Show[Graphics[{RGBColor[0.5, 1.0, 0.9],
               Disk[{0,0},2]}],
     AspectRatio->Automatic]
```


Out[50]=

```
-Graphics-
```

In[51]:=

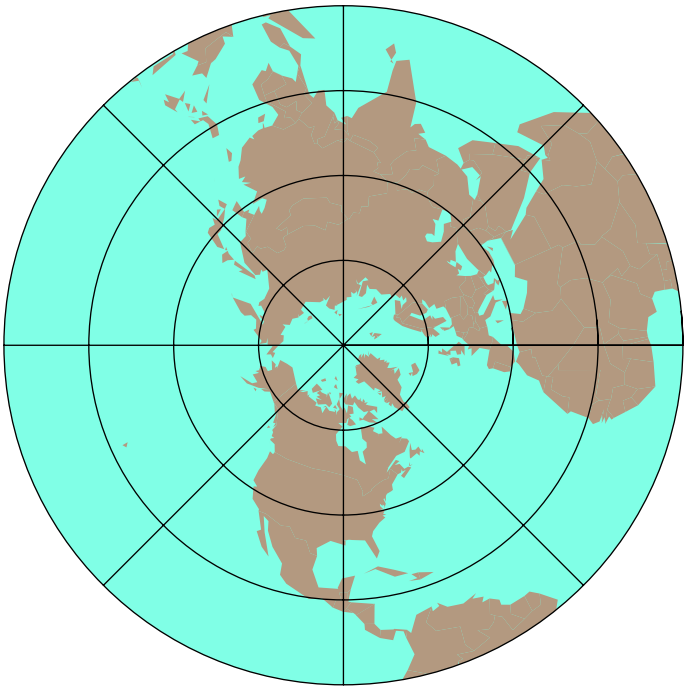
```
Show[%,%% /. p_Polygon :>
          {RGBColor[.7,.6,.5],p}]
```

Out[51]=

```
-Graphics-
```

In[52]:=

```
Show[%,
  Graphics[
    Table[Circle[{0,0},r],{r,0,2,.5}]],
  Graphics[
    Table[Line[{{0,0},
                {2Cos[a],2Sin[a]}}],
          {a,0,2Pi,Pi/4}]]]
```



Out[52]=

-Graphics-

Come modificare il sistema

(* da completare *)

Attributi e opzioni

```
(* da completare *)
```