Cobweb diagrams / Cobweb Diagramme

Some examples for the graphical representation of linear difference equations (recursive equations) of order one by means of "cobweb" diagrams.

Einige Beispiele für die Darstellung linearer Differenzengleichungen (Rekursionsgleichungen) erster Ordnung mit Hilfe von sog. cobweb-Diagrammen.

```
load(draw);
```

C:/maxima-5.45.1/share/maxima/5.45.1/share/draw/draw.lisp

```
set_draw_defaults(
 user_preamble="set size ratio -1",    /* keine Verzerrung in y-Richtung  */
 dimensions=[300,300] )$
```

```
noframe : [axis_bottom=false,axis_left=false,axis_right=false,axis_top=false,
xaxis=true,yaxis=true,xtics_axis=true,ytics_axis=true] $
```

```
noframe_option : [] $
```

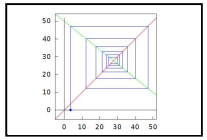
```
noframe_option : noframe $
```

```
cobweb(a, b, y0, n) :=
 block([xmin, xmax, ymin, ymax, y:y0, ynew, L :[[y0,0]] ],
  for k : 1 thru n do
   (ynew : y*a+b, L : append(L, [[y, ynew], [ynew, ynew] ] ), y : ynew),
  xmin : lmin(map(first, L)),
  xmax : lmax(map(second, L)) ,
  if xmin >= 0 then xmin : -0.1*abs(xmax),
  if xmax <= 0 then xmax :  0.1*abs(xmin),
  xmin : xmin * 1.1, xmax : xmax *1.1 ,
  ymin : xmin, ymax : xmax,
  G1 : [color=green, point_size=0, points_joined=true, points([[xmin, xmin*a+b],[xmax, xmax*a+b]])],
  G2 : [color=red,   point_size=0, points_joined=true, points([[xmin, xmin],[xmax, xmax]])],
  G3 : [color=black, point_size=0, points_joined=true, points([[xmin, 0],[xmax, 0]])],
  G4 : [color=black, point_size=0, points_joined=true, points([[0, ymin],[0, ymax]])],
  G5 : [color=blue, point_type=filled_circle, point_size=1, points([[y0,0]])],
  G6 : [color=blue, point_size=0, points_joined=true, points(L)],
  wxdraw2d(noframe_option, G1, G2, G3, G4, G5, G6) );
```

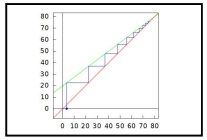
$$\text{cobweb}(a,b,y0,n):=\text{block}\left(\left[xmin,xmax,ymin,ymax,y:y0,ynew,L:[[y0,0]]\right],\text{for } k \text{ thru } n \text{ do } \left(ynew:y\ a+b,L:\text{append}(L,[[y,ynew],[ynew,ynew]]),y:ynew\right),xmin:\text{lmin}(\text{map}(first,L)),xmax:\text{lmax}(\text{map}(second,L)),\text{if } xmin\geq 0 \text{ then } xmin:(-0.1)\left|xmax\right| ,\text{if } xmax\leq 0 \text{ then } xmax:0.1\left|xmin\right| ,xmin:xmin\ 1.1,xmax:xmax\ 1.1,ymin:xmin,ymax:xmax,G1:[color=green,point_size=0,points_joined=\textbf{true},\text{points}([[xmin,xmin\ a+b],[xmax,xmax\ a+b]])],G2:\left[color=red,point_size=0,points_joined=\textbf{true},\text{points}([[xmin,xmin],[xmax,xmax]])\right],G3:\left[color=black,point_size=0,points_joined=\textbf{true},\text{points}([[xmin,0],[xmax,0]])\right],G4:\left[color=black,point_size=0,points_joined=\textbf{true},\text{points}([[0,ymin],[0,ymax]])\right],G5:\left[color=blue,point_type=filled_circle,point_size=1,\text{points}([[y0,0]])\right],G6:
```
```

noframe_option : [] $

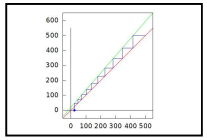
cobweb(-0.8, 50, 3.5, 12) $



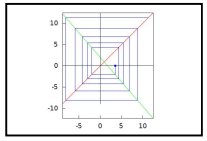
cobweb(0.75, 20, 3.5, 10) $



cobweb(1.15, 20, 23, 10) $

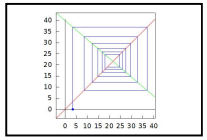


cobweb(-1.15, 2, 3.5, 10) $

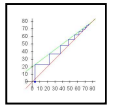


noframe_option : noframe $

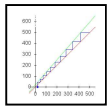
cobweb(-0.85, 40, 3.5, 12);



cobweb(0.75, 20, 3.5, 10);



```
cobweb(1.15, 20, 23, 10);
```



```
cobweb(-1.15, 2, 3.5, 10);
```