
Preamble

```
(* The following lines of code are based on Debra Lewis'
   notebooks found at http://people.ucsc.edu/~lewis/Math145/ *)
```

```
In[1]= cobwebLast[f_, start_, range_, n_, plotColor_: Blue] :=
  With[{values = NestList[f, start, n]},
    Show[{
      Plot[{x, f[x]}, Evaluate[Prepend[range, x]], PlotRange -> {range, range}],
      ListPlot[Prepend[Join@@
        ({#, {Last[#], Last[#]}} & /@ Partition[values, 2, 1]), {start, 0}], PlotStyle ->
        {plotColor}, Joined -> True, PlotStyle -> Dashed, PlotRange -> {range, range}],
      Graphics[{PointSize[Large], plotColor, Point[{values[[-1]], values[[-1]]}]}]}],
    AspectRatio -> 1]
  ]
```

```
In[2]= eventual[a_] := Union[Drop[NestList[a # (1 - #) &, Random[], 1000], 900],
  SameTest -> (Chop[#1 - #2] < 10-4 &)]
```

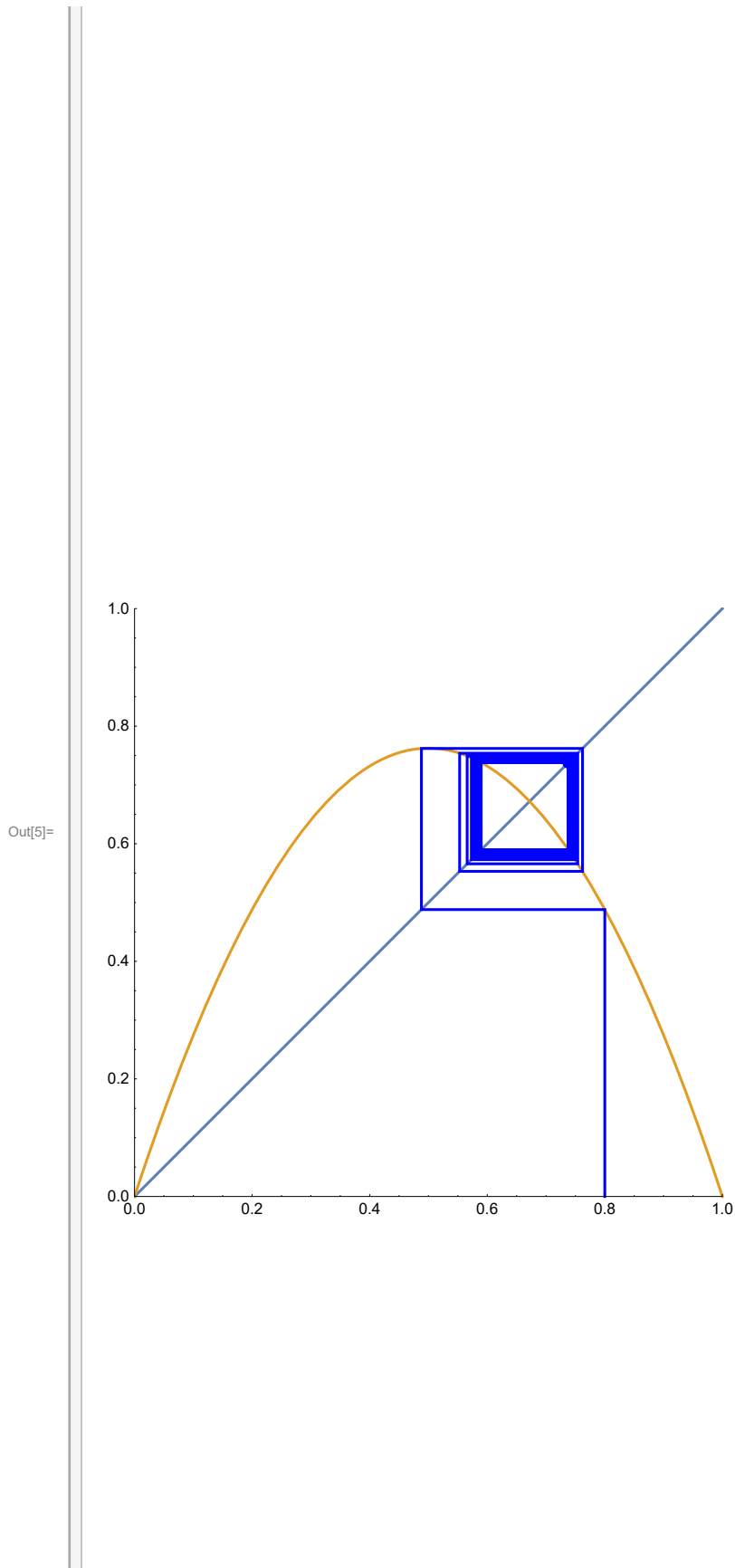
```
In[3]= logbif[low_, high_, inc_] :=
  ListPlot[Join@@Table[{a, #} & /@ eventual[a], {a, low, high, inc}],
  PlotStyle -> PointSize[Small], PlotRange -> {{low, high}, {0, 1}}
```

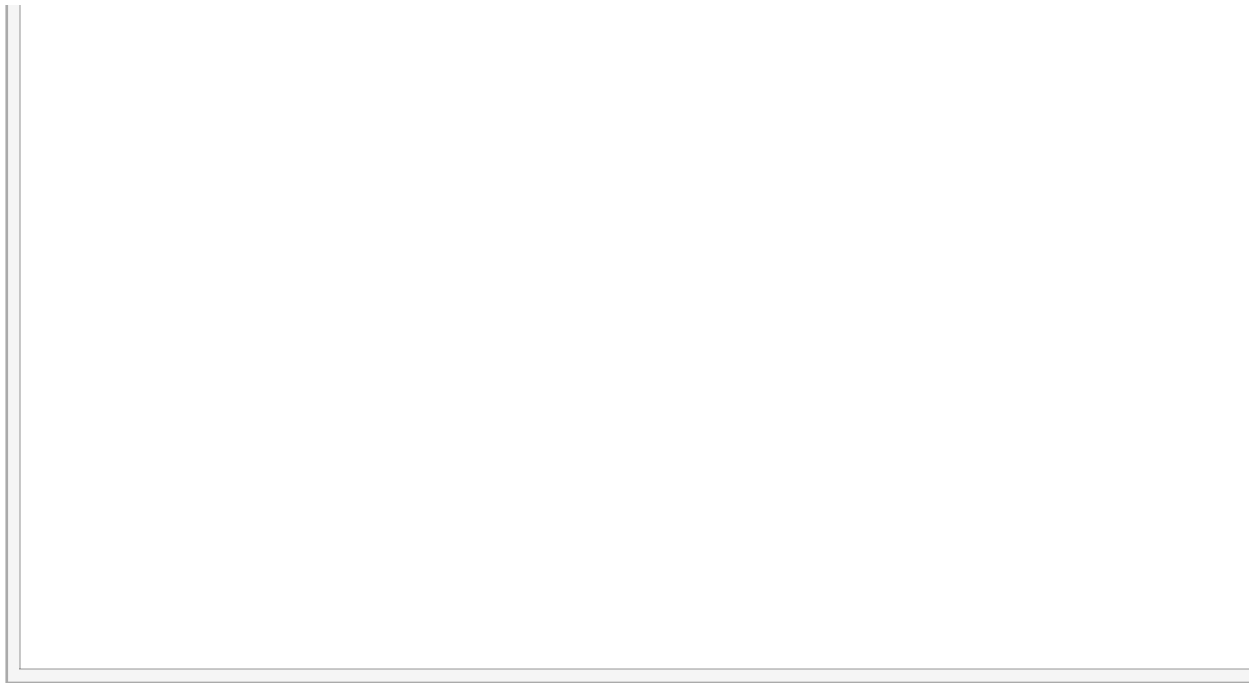
Logistic Map

```
In[4]= f := Function[x, r x (1 - x)]
```

```
In[5]= Animate[cobwebLast[f /. r -> 3.05, .8, {0, 1}, s, Blue], {s, 1, 50, 1}]
```



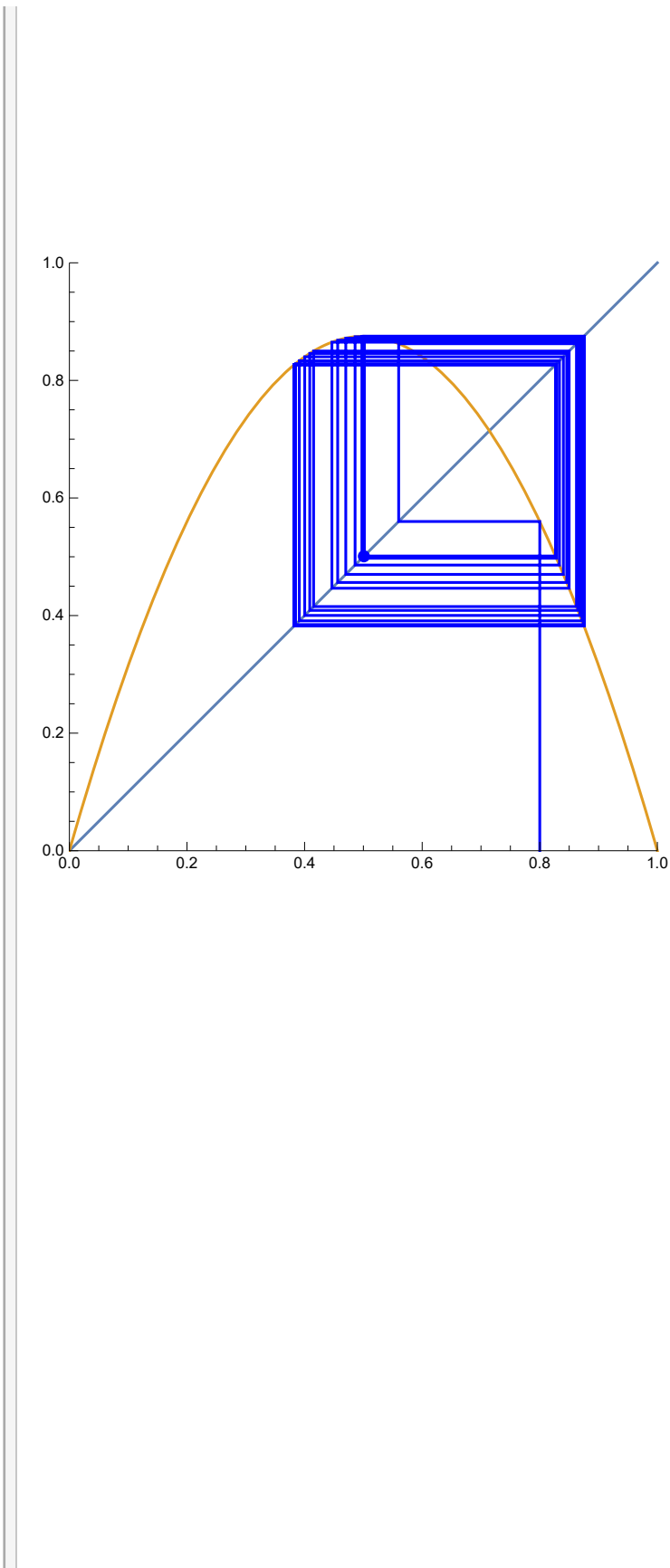




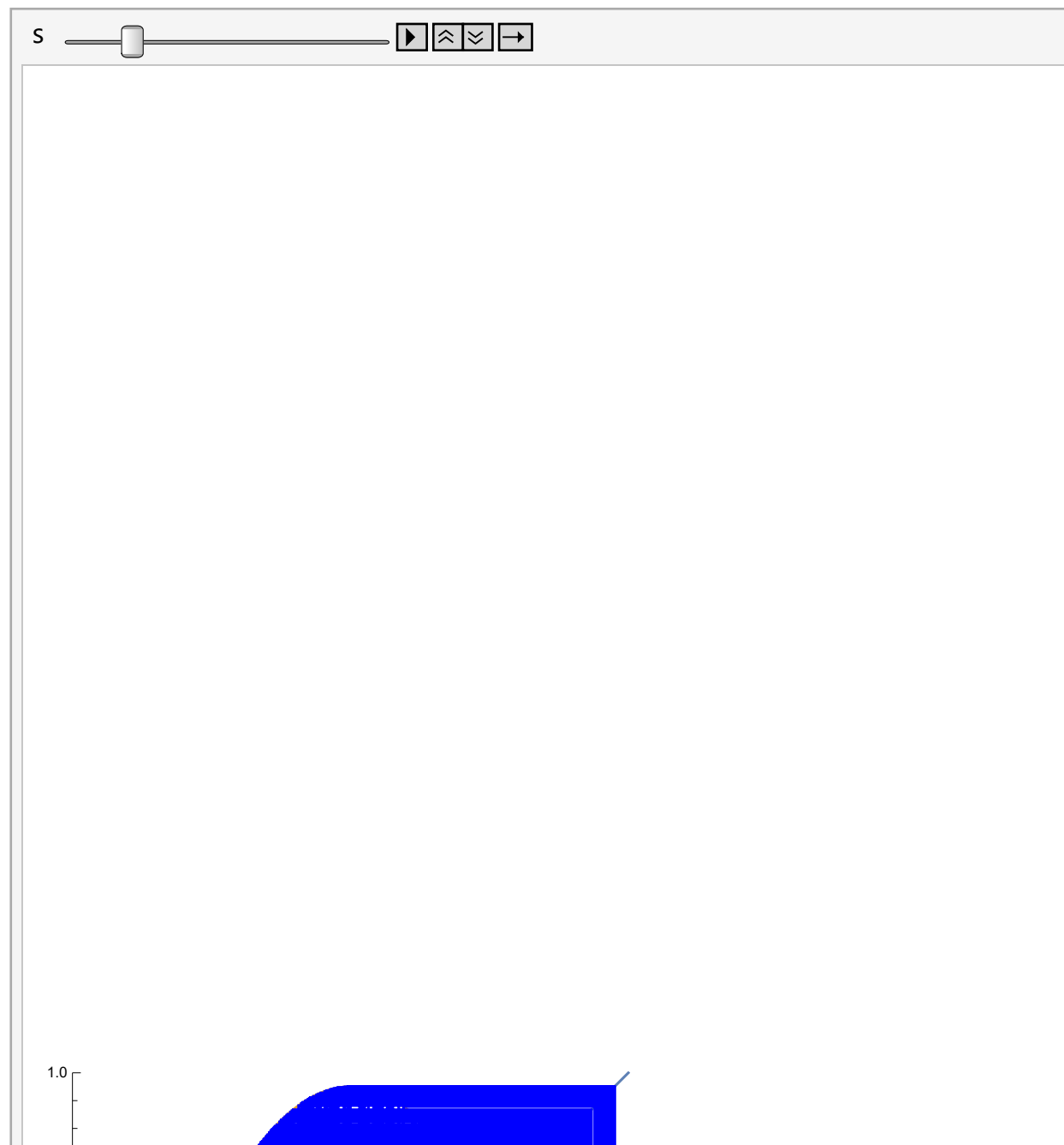
```
Animate [cobwebLast[f /. r -> 3.5, .8, {0, 1}, s, Blue], {s, 1, 50, 1}]
```

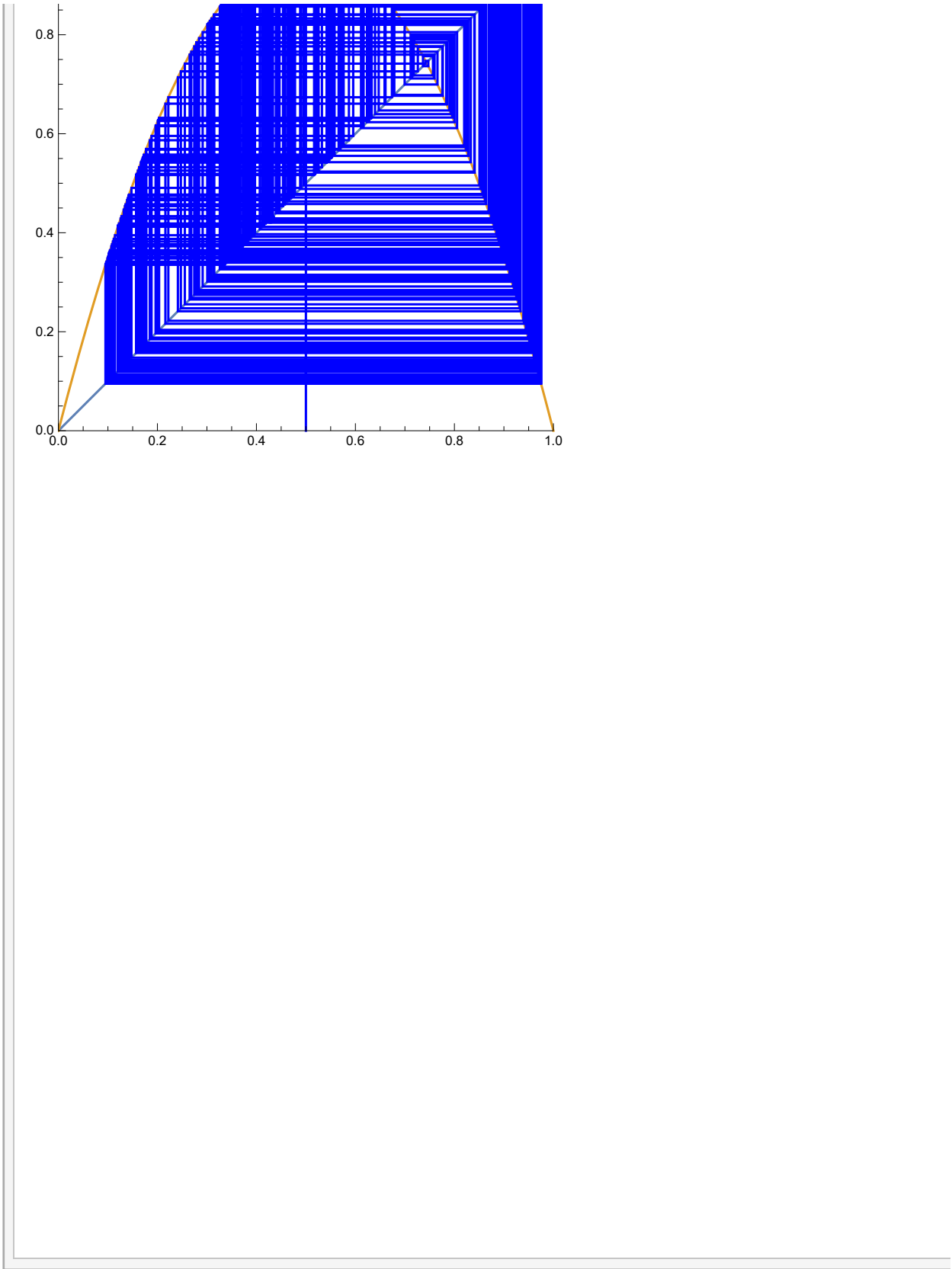
S A control bar for the animation. It features a slider labeled 'S' with a small rectangular knob positioned at approximately the 30% mark. To the right of the slider are four square navigation icons: a play button (right-pointing triangle), a step up button (upward-pointing triangle), a step down button (downward-pointing triangle), and a stop button (square with a right-pointing arrow).



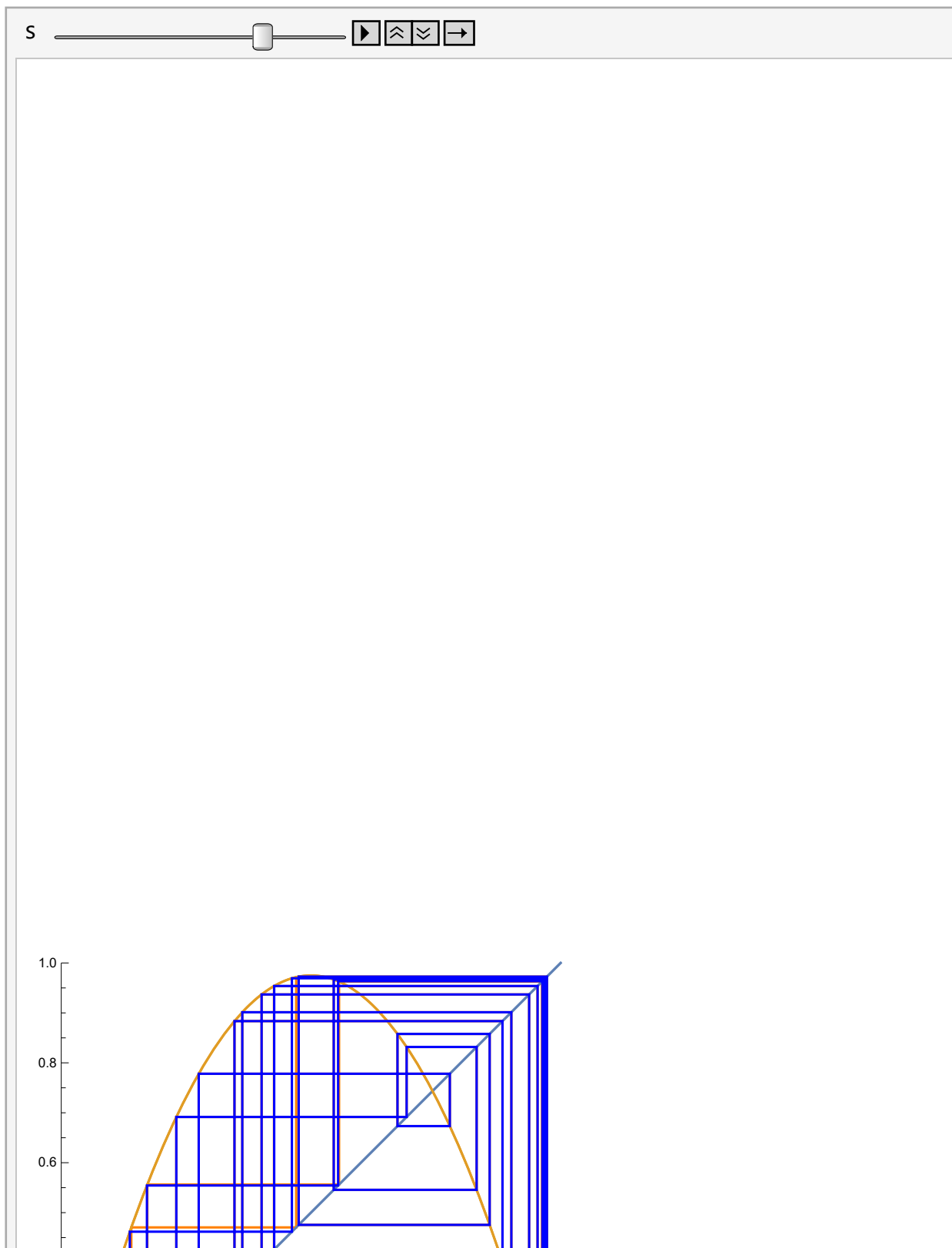


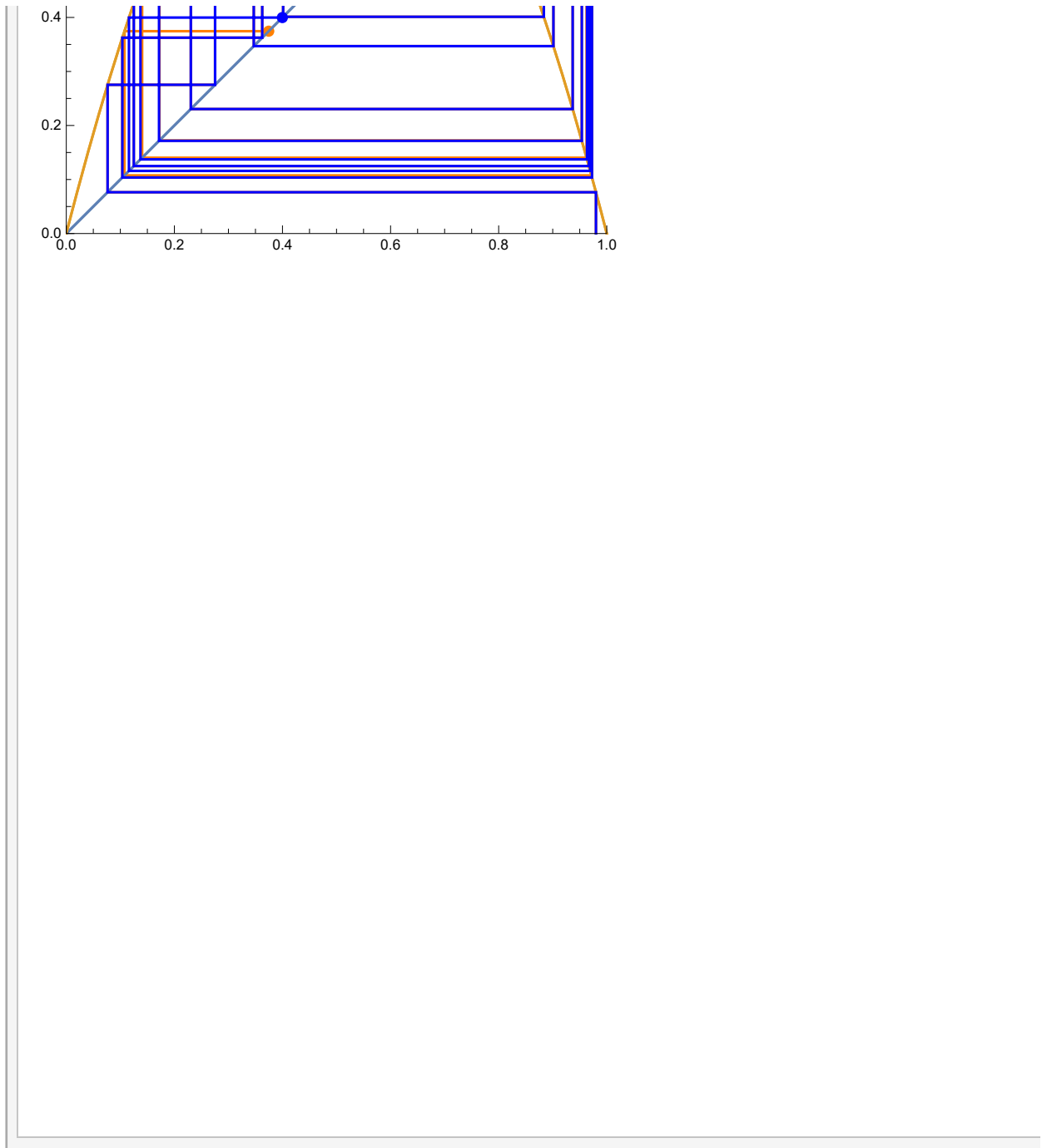
```
Animate [cobwebLast[f /. r -> 3.9, .5, {0, 1}], s, Blue], {s, 1, 2000, 1}]
```



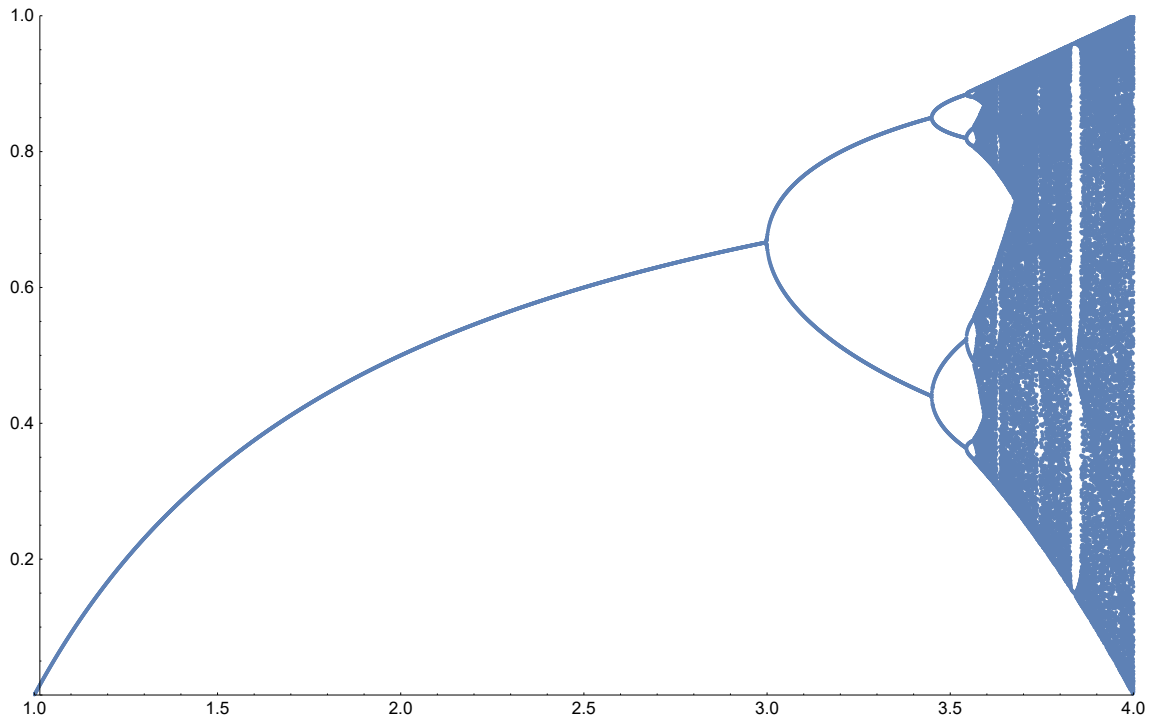


```
Animate [Show[cobwebLast[f /. r → 3.9, .98, {0, 1}, s, Orange],  
cobwebLast[f /. r → 3.9, .98 + 0.000000001, {0, 1}, s, Blue]], {s, 1, 40, 1}]
```





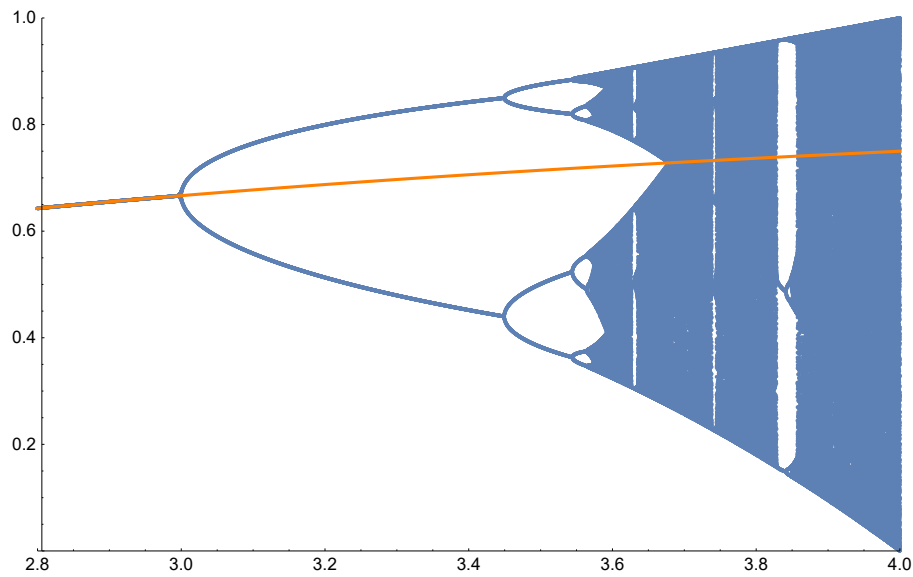
```
g1 = logbif[1, 4, .001]
```

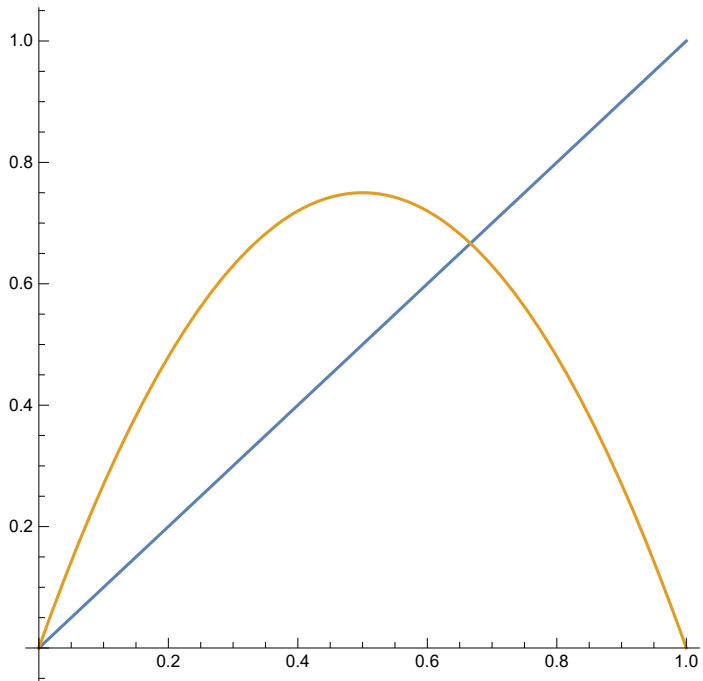
```
In[6]:= g1 = logbif[2.8, 4, .0002];
```

```
g2 = Plot[1 - 1/r, {r, 1, 4}, PlotStyle -> {Interpreter["Color"]["orange"]}];
```

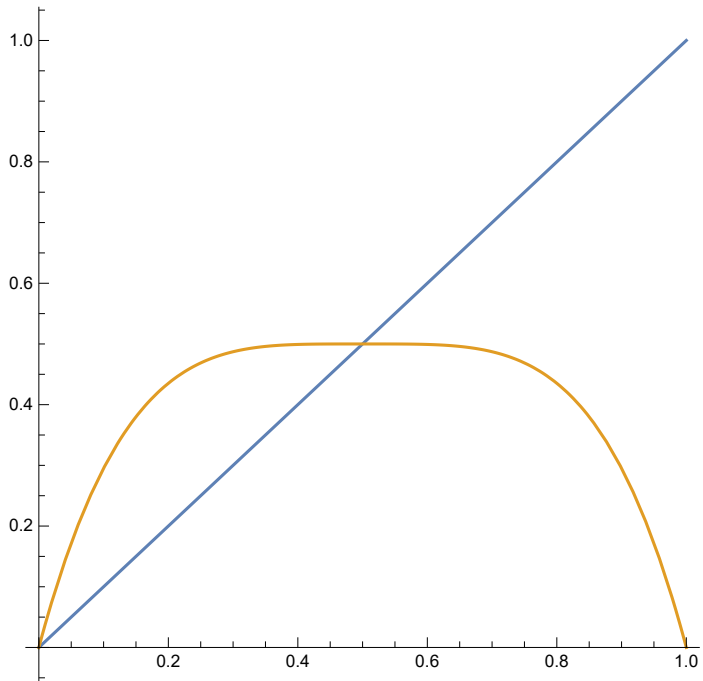
```
Show[g1, g2]
```



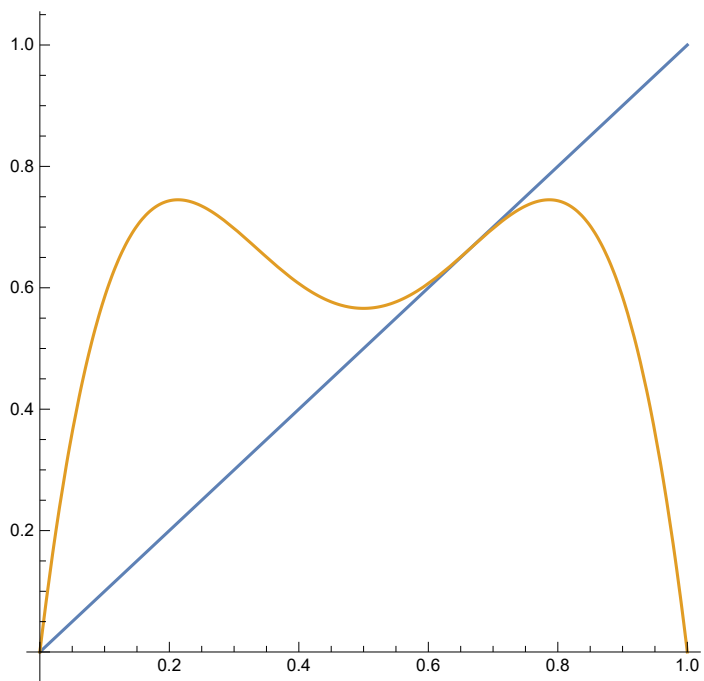
```
Plot[{x, Nest[f /. r -> 3, x, 1]}, {x, 0, 1}, AspectRatio -> 1]
```



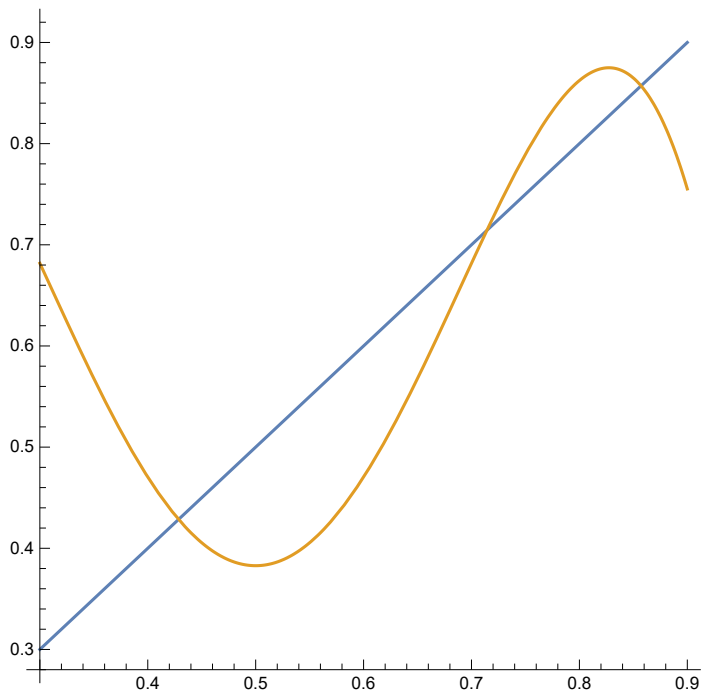
```
Plot[{x, Nest[f /. r -> 2, x, 2]}, {x, 0, 1}, AspectRatio -> 1]
```



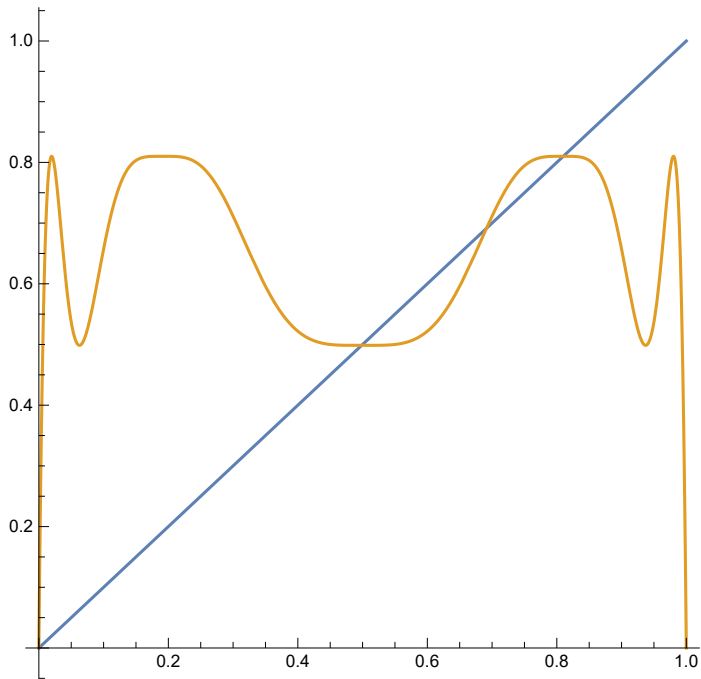
```
Plot[{x, Nest[f /. r -> 2.98, x, 2]}, {x, 0, 1}, AspectRatio -> 1]
```



```
Plot[{x, Nest[f /. r -> 3.5, x, 2]}, {x, .3, .9}, AspectRatio -> 1]
```



```
Plot[{x, Nest[f /. r -> 3.24, x, 4]}, {x, 0, 1}, AspectRatio -> 1]
```



```
Plot[{x, Nest[f /. r -> 3.4, x, 4]}, {x, 0, 1}, AspectRatio -> 1]
```

