

Cobweb plots

Definitions

```
plain1[f_, start_, n_] :=  
  Show[Graphics[Point[{#, 0}] & /@ NestList[f, start, n]],  
  AspectRatio -> .2]  
  
plain2[f_, start_, n_] :=  
  ListPlot[#, Mesh -> All, Joined -> True, PlotRange ->  
    {{0, n}, {Min[#, Max[#]]}}] & [NestList[f, start, n]]  
  
cobweb[f_, start_, range_, n_] :=  
  Show[{Plot[{x, f[x]}, Evaluate[Prepend[range, x]],  
    PlotRange -> {range, range}], ListPlot[Prepend[Join @@  
    ({#, {Last[#, Last[#]}]} & /@  
      Partition[NestList[f, start, n], 2, 1]), {start, 0}],  
    PlotJoined -> True, PlotStyle -> Dashed,  
    PlotRange -> {range, range}]], AspectRatio -> 1]
```

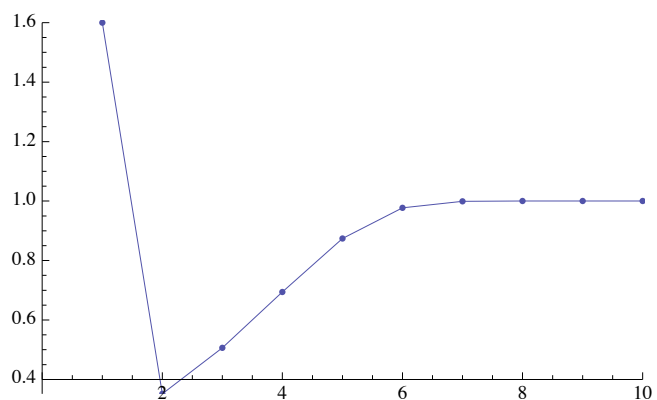
Examples

- Example 1: $f(x) = \frac{1}{2}(3x - x^3)$

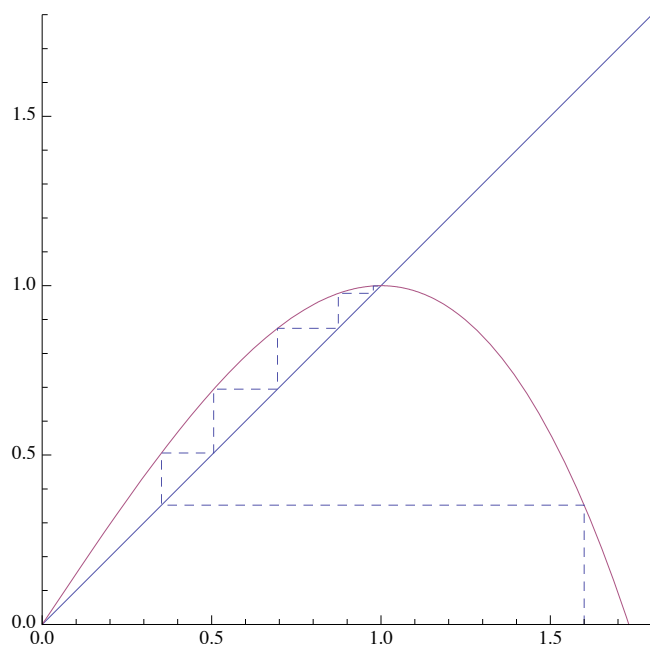
```
plain1[ $\frac{1}{2}(3\# - \#^3)$  &, 1.6, 10]
```

.

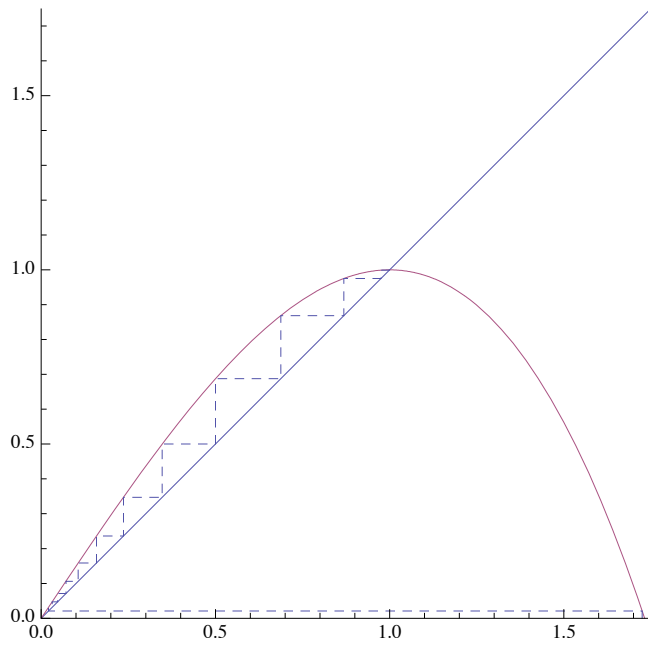
plain2 $\left[\frac{1}{2} (3 \# - \#^3) \&, 1.6, 10\right]$



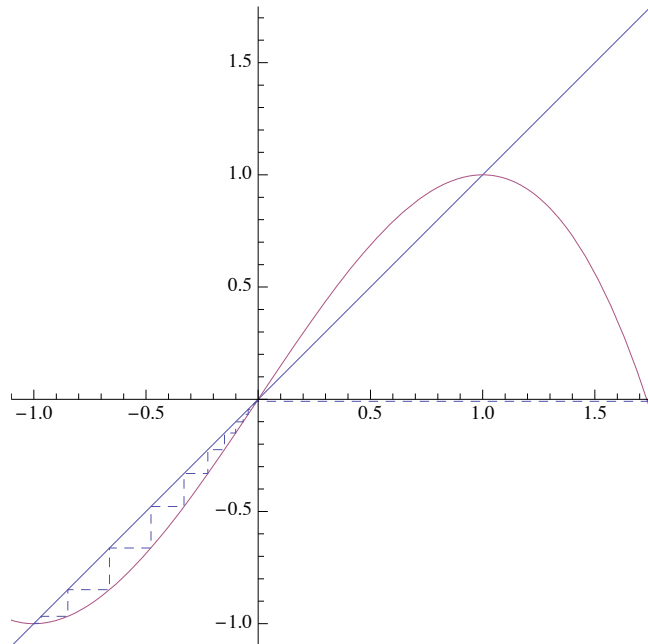
cobweb $\left[\frac{1}{2} (3 \# - \#^3) \&, 1.6, \{0, 1.8\}, 20\right]$



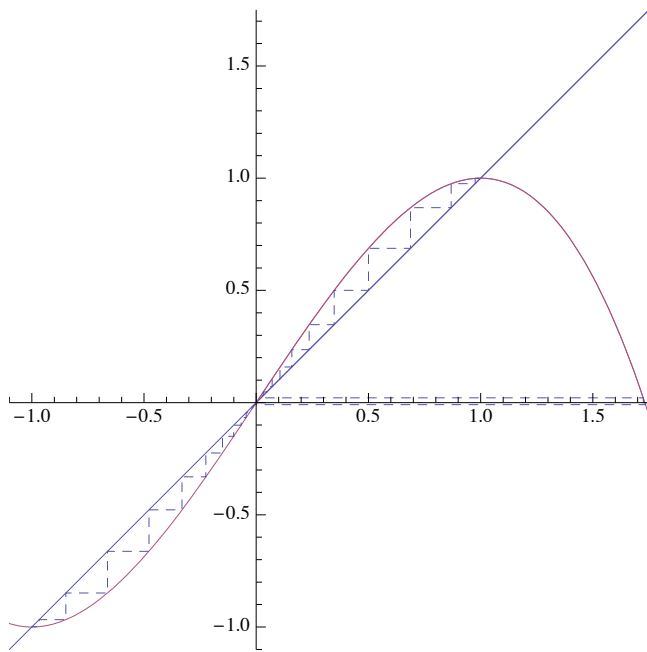
cobweb $\left[\frac{1}{2} (3 \# - \#^3) \&, 1.725, \{0, 1.75\}, 20\right]$



cobweb $\left[\frac{1}{2} (3 \# - \#^3) \&, 1.735, \{-1.1, 1.75\}, 20\right]$



Show[{%, %%}]

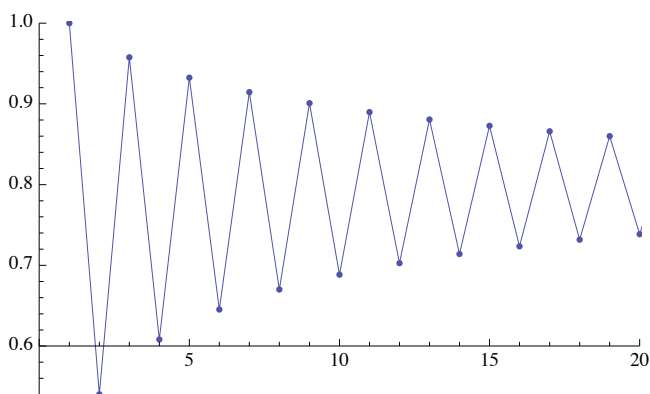


■ Example 2: $f(x) = \cos(x^2)$

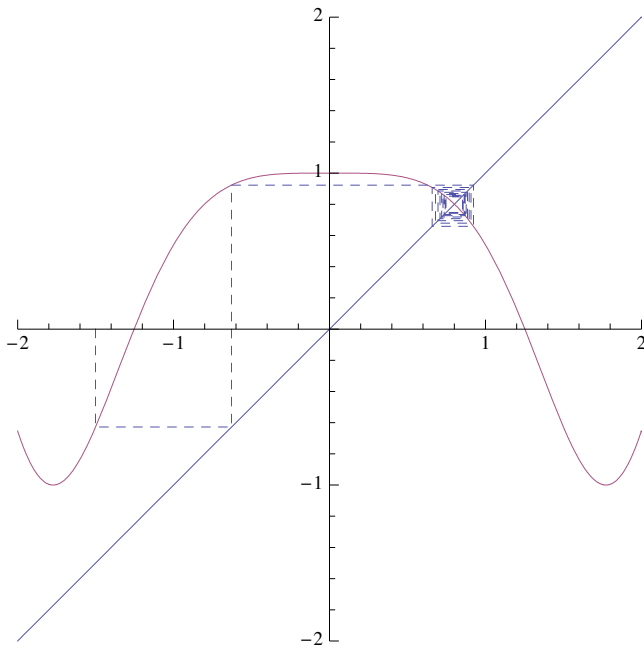
plain1[Cos[#^2] &, 1, 20]

.

plain2[Cos[#^2] &, 1, 20]



```
cobweb[Cos[#^2] &, -1.5, {-2, 2}, 20]
```

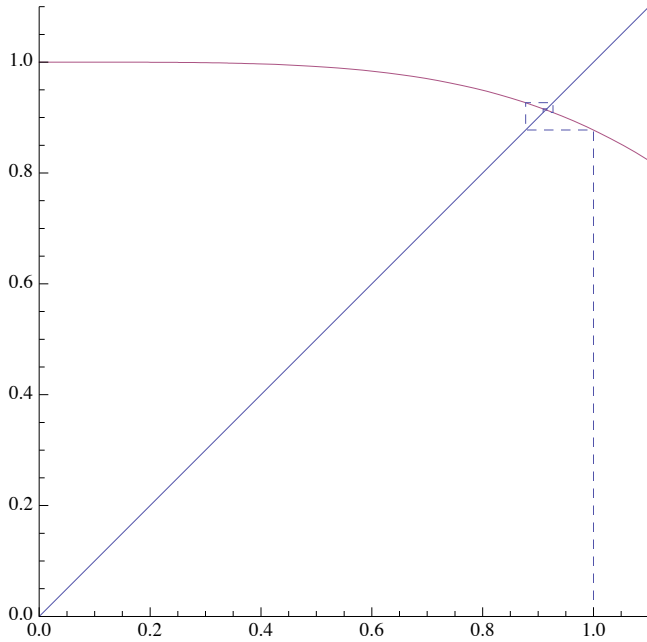


```
FindRoot[Cos[x^2] == x, {x, .8}]
```

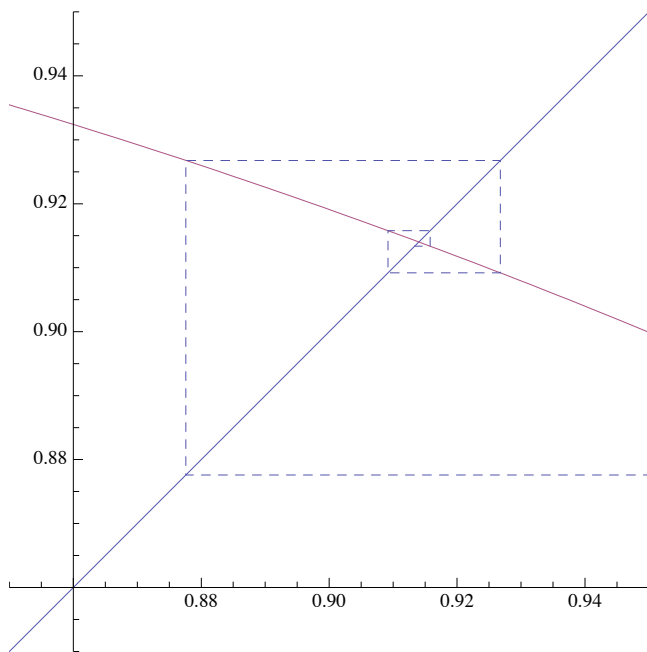
```
{x -> 0.801071}
```

■ Example 3: $f(x) = \cos\left(\frac{x^2}{2}\right)$

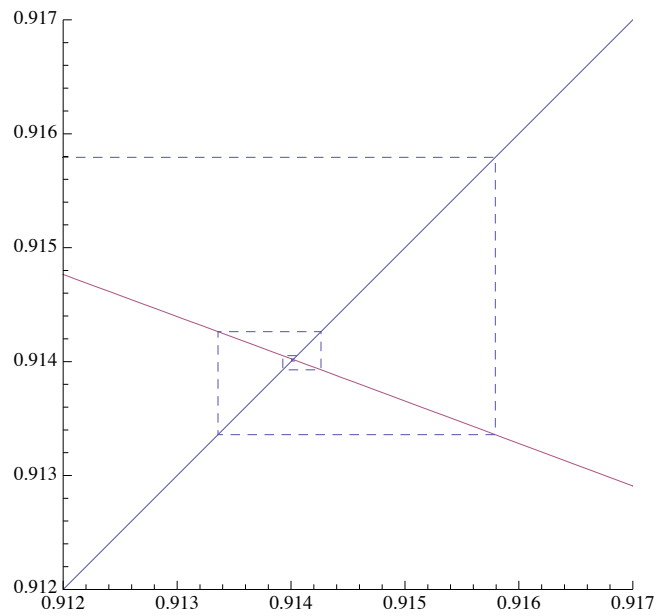
`cobweb[Cos[#^2/2] &, 1, {0, 1.1}, 5]`



`cobweb[Cos[#^2/2] &, 1, {.85, .95}, 5]`



```
cobweb[Cos[#^2/2] &, 1, {.912, .917}, 10]
```



```
FindRoot[Cos[x^2/2] == x, {x, .91}]
```

```
{x -> 0.914018}
```

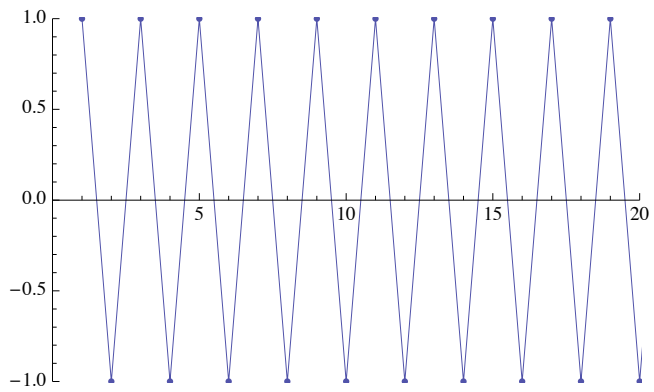
■ **Example 4:** $f(x) = \sin\left(-\frac{\pi}{2} x\right)$

```
plain1[Sin[-π/2 #] &, 1, 20]
```

•

•

```
plain2[Sin[- $\frac{\pi}{2}$  #] &, 1, 20]
```



```
cobweb[Sin[- $\frac{\pi}{2}$  #] &, 1, 1.1 {-1, 1}, 20]
```

