Building a Cobweb Applet Due: September 18th, 2017

Write a program that will create a cobweb diagram for functions $f : [a, b] \to [a, b]$, any initial condition $x_0 \in [a, b]$ and n iterations. You may use Mathematica Stack Exchange and work together. You must understand your code.

Turn in: A printed copy of your (annotated) working code. Find and print off several functions showing these different types of behavior (be creative):

- A sink.
- A periodic point.
- A source (a repelling fixed point), choose an initial condition close to the fixed point to demonstrate.
- Pictures demonstrating sensitivity to initial conditions $|x_0 - x_0'| \approx .001$.

Finally, send me an email with your working code attached.

---

1. Define a function `f[x_] := 4*x*(1-x)`, this is the full logistic map.
2. Plot f using `Plot[f[x], {x, 0, 1}]`.
3. Plot the line $y = x$ on the same graph. `Plot[{f[x], g[x]}, {x, 0, 1}]` will allow you to plot multiple functions at once.
4. Create a list of iterates: $x_0, f(x_0), f(f(x_0)), \ldots$. I built a list using "Table" and "Nest". To read the 4th element from a list called ListName, use `ListName[[4]]`.
5. Figure out the endpoints of the lines that you want to plot (these will be coming from your list).
6. `Plot[x^2, {x, 0, 1}, Prolog->Line[{{.1, .2},{.3, .5},{1, 0}}]]` will give a graph including
   - the curve $y = x^2$ on the interval $0 \leq x \leq 1$,
   - the line segment from $(.1, .2)$ to $(.3, .5)$ and,
   - the line segment from $(.3, .5)$ to $(1, 0)$.
7. You might want to use `Take[ListName, n]` to take the first n entries from your list. The code `Partition[ListName, 2]` will put braces around pairs of elements in your list.
8. Annotate your code so that a person opening your document can understand what you're doing. Make the pictures look nice. At the beginning of your document, allow the user to type in a function, endpoints a and b, an initial condition x_0 and a value n. Executing the document should give a cobweb diagram for these conditions.