

```
logimap_lecture(n); % n=1:7
calls the scripts here.
```

The scripts advance after you answer the command window query.

```
% ----- %
```

DESCRIPTION

```
logimap_lecture(1)
```

Logistic map and fixed points as  $r$  grows, with cobwebs, showing the following bifurcations:

At  $r = r_0 = 1$ , a transcritical bifurcation occurs.

At  $r = r_1 = 3$ , a period 2 solution appears.

At  $r = r_2 \sim 3.4495$ , a period doubling occurs.

At  $r = r_3 \sim 3.5441$ , a period doubling occurs.

At  $r = r_{\infty} \sim 3.5699$ , chaos occurs.

At  $r = r_{\text{per}3} \sim 3.5699$ , a period 3 solution occurs.

```
logimap_lecture(2)
```

Logistic map with pre-images of  $x=1/2$  shown, associated with the second iterate,  $f_2$ , developing multiple extrema.

```
logimap_lecture(3)
```

Logistic map with pre-pre-images of  $x=1/2$  shown, associated with the third iterate,  $f_3$ , developing multiple extrema.

```
logimap_lecture(4)
```

Evolution of the second iterate,  $f_2$ , as  $r$  grows. The two additional fixed points that arise for  $r > 3$  are associated with a period 2 solution --- stable at birth and eventually going unstable.

```
logimap_lecture(5)
```

Evolution of the third iterate,  $f_3$ , as  $r$  grows. The 6 additional fixed points that arise beyond  $r \sim 3.8284$  correspond to two period 3 solutions (one stable, initially, and the other unstable).

A cobweb below this transition illustrates the phenomena of intermittency.

```
logimap_lecture(6)
```

Evolution of the second second iterate,  $f_2$ , as  $r$  grows. Shows how beyond  $r = 2$  there is a smaller square (in green) where  $f_2$  reproduces the behavior of  $f_1$  in the unit square (for a smaller range of  $r$ 's:  $2 < r < 3.65\dots$ ). This is the basis for the renormalization argument.

```
logimap_lecture(7)
```

Repeat of `logimap_lecture(6)`, but for the shifted map

$F(x, r) = f(0.5+x, r) - 1/2 = r*(0.25-x^2)-1/2$   $[-0.5 < x < 0.5]$

which then makes all the "green squares" also centered at the origin.

```
%
```

```
% ----- %
```

```
% EOF
```