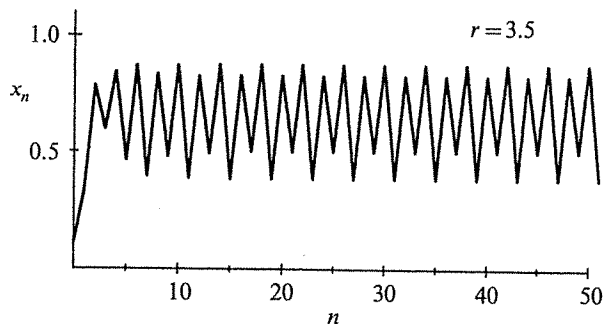
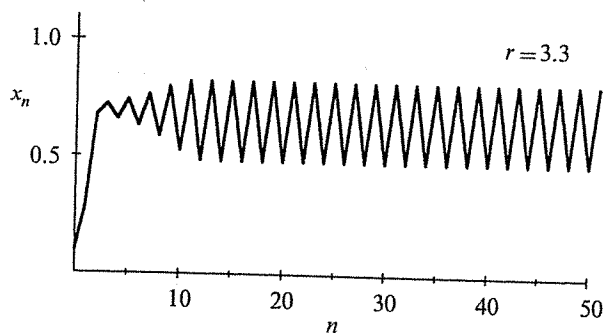
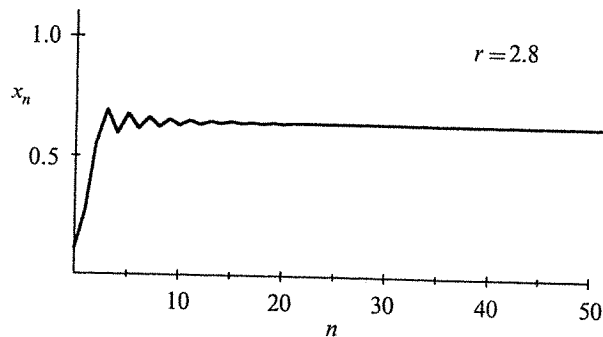


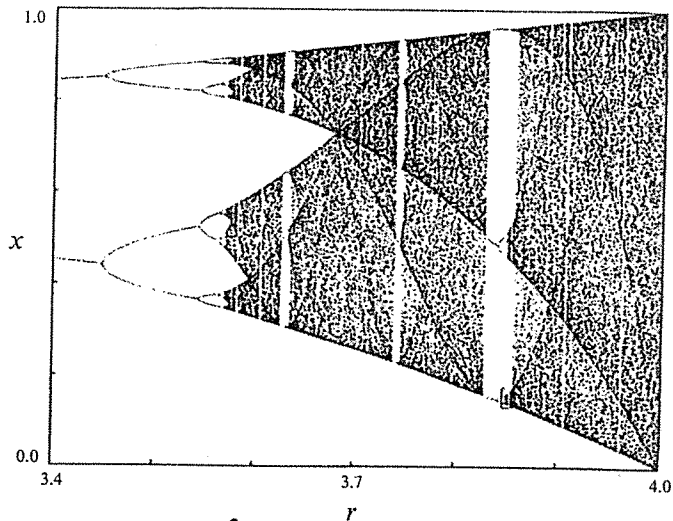
Period Doubling Cascade: $f(x) = rx(1-x)$



Above shows period 1, 2, 4 orbits as r increases

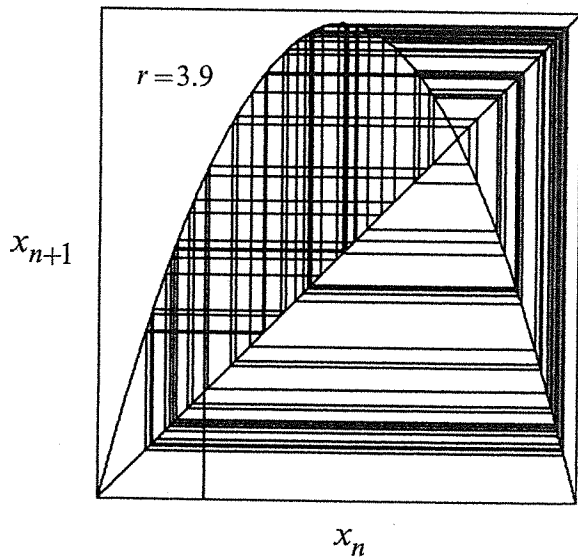
$r_1 = 3$	$T = 2$
$r_2 = 3.449\dots$	$T = 4$
$r_3 = 3.54409\dots$	$T = 8$
$r_4 = 3.5644\dots$	$T = 16$
\vdots	
$r_\infty = 3.569946$	

where $r_n \rightarrow \infty$ and $\delta = \lim_{n \rightarrow \infty} \frac{r_n - r_{n-1}}{r_{n+1} - r_n} = 4.669\dots$ (Feigenbaum Constant)
shows geometric growth.



↑
 r_{∞} last of 2^k periods

Shows all bifurcations
 for $r \in (3.4, 4.0)$.
 At smaller r
 the period 2
 cascade is
 evident.



Shows a chaotic
 orbit for $r=3.9$