Work Sheet 10

Here is a more detailed look at the dynamical system

$$N_{t+1} = aN_t(1 - N_t).$$

Recall that for a discrete dynamical

$$N_{t+1} = f(N_t)$$

$N_{1+t} = a\, N_t\, (1 - N_t)\, a = 0.1 P_0 = 0.3$

$N_{1+t} = a\, N_t\, (1 - N_t)\, a = 0.5 P_0 = 0.3$

$N_{1+t} = a\, N_t\, (1 - N_t)\, a = 1.0 P_0 = 0.3$

$N_{1+t} = a\, N_t\, (1 - N_t)\, a = 2.0 P_0 = 0.3$

$N_{1+t} = a\, N_t\, (1 - N_t)\, a = 3.0 P_0 = 0.3$
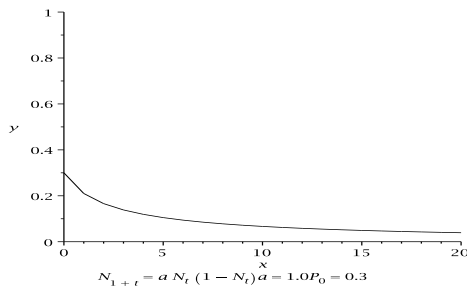
$N_{1+t} = a\, N_t\, (1 - N_t)\, a = 3.5 P_0 = 0.3$

$N_{1+t} = a\, N_t\, (1 - N_t)\, a = 3.8 P_0 = 0.3$

$N_{1+t} = a\, N_t\, (1 - N_t)\, a = 3.8 P_0 = 0.35$

$$N_{1+t} = a\, N_t\, (1-N_t) \quad a = 3.95 P_0 = 0.3$$

$$N_{1+t} = a\, N_t\, (1-N_t) \quad a = 3.95 P_0 = 0.31$$
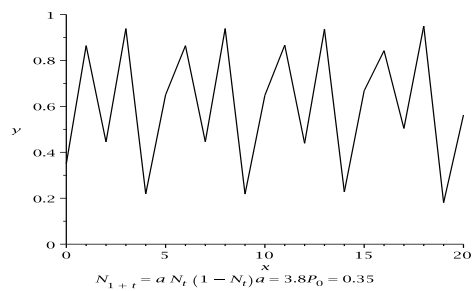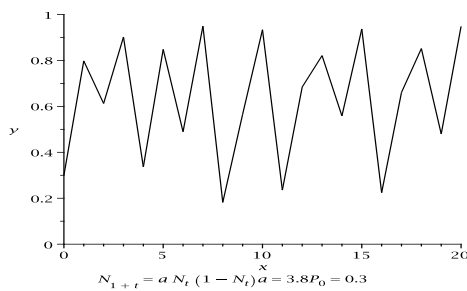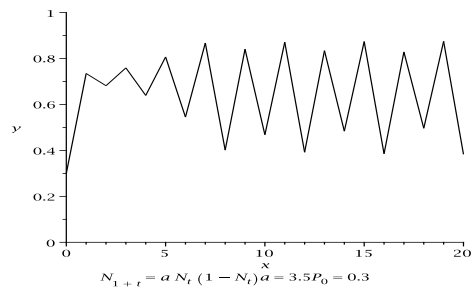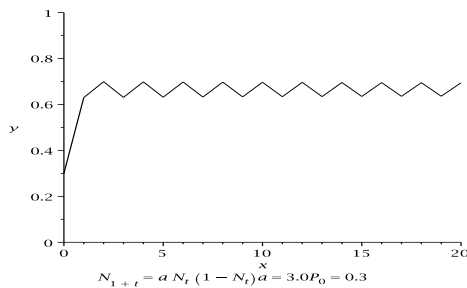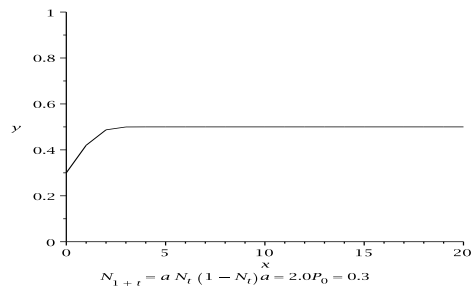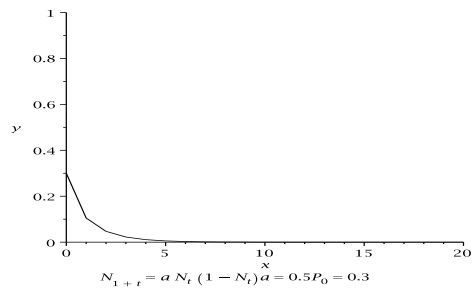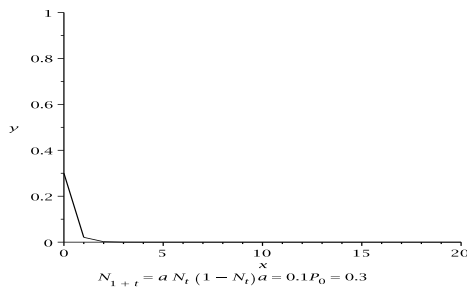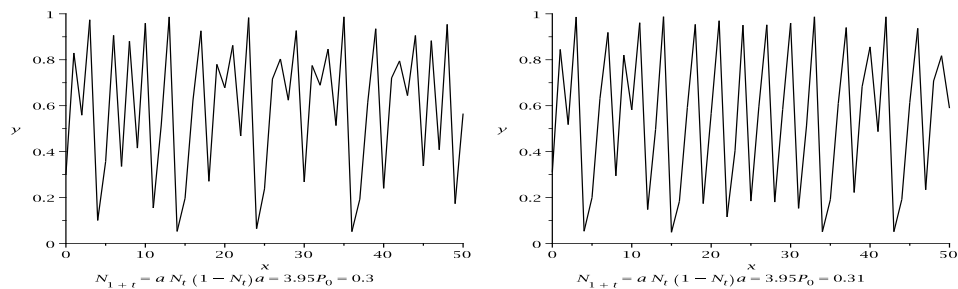
Here are some problems for you. Find the equilibrium points and classify as to stable. Also write out and graph the first 4 steps in the times series for the system with the given N_0

(1) $N_{t+1} = 3.7N_t(1-N_t), \quad N_0 = .7$

(2) The discrete logistic with per capita growth rate $R = .8$ and carrying capacity $K = 100$. $\quad N_0 = 10$.

(3) The discrete logistic with per capita growth rate $R = 2.2$ and carrying capacity $K = 100$. $\quad N_0 = 10$.

(4) The discrete logistic with per capita growth rate $R = 3.0$ and carrying capacity $K = 100$. $\quad N_0 = 10$.

(5) The **Ricker model** with per capita growth rate $R = 2.0$ and capacity $K = 1{,}00$

$$N_{t+1} = N_t e^{R\left(1-\frac{N_t}{K}\right)}$$

and $N_0 = 300$.