Mathematics 172 Homework.

We have been looking at discrete dynamical systems of the form

$$P_{t+1} = f(P_t).$$

First off there is just the basic problem of computing with these.

Problem 1. For the discrete dynamical system

$$P_{t+1} = P_t + 1.4P_t\left(1 - \frac{P_t}{200}\right) \qquad P_0 = 75$$

Find P_1, P_2, P_3, and P_4.

Solution. Use the calculator to find that

$$P_1 = 140.625$$
$$P_2 = 199.072$$
$$P_3 = 200.365$$
$$P_4 = 199.853$$

□

Problem 2. For the system

$$N_{t+1} = 1.2N_t e^{1-N_t/20} \qquad N_0 = 9$$

find N_1, N_2, N_3, and N_4.

Solution. This time we get

$$N_1 = 18.7191$$
$$N_2 = 23.9486$$
$$N_3 = 23.5895$$
$$N_4 = 23.6567$$

□

Problem 3. For the system of Problem 2 find the equilibrium points by solving the equation

$$N = 1.2Ne^{1-N/20}$$

on your calculator.

Solution. One solution is $N = 0$, which we can see just by looking at the equation. To find the other one plot $\backslash$Y1 = 1.2X(1-X/20) and $\backslash$Y2 = X with Xmin = 0 and Xmax = 30 and use the calculator to find the ingestion of the graphs. The other equilibrium point is $N = 23.6464$. □