Mathematics 172

Quiz 9 Name: Key

You must show your work to get full credit.

1. For the discrete dynamical

$$P_{t+1} = \frac{25P_t}{1 + .3P_t^2}, \qquad P_0 = 10$$

compute the following: $P_1 =$ 8.0645 $P_2 =$ 9.8295 $P_3 =$ 8.1951

(a) We wish to find the equilibrium points of the system above. What is the equation we need to solve to find the equilibrium points?

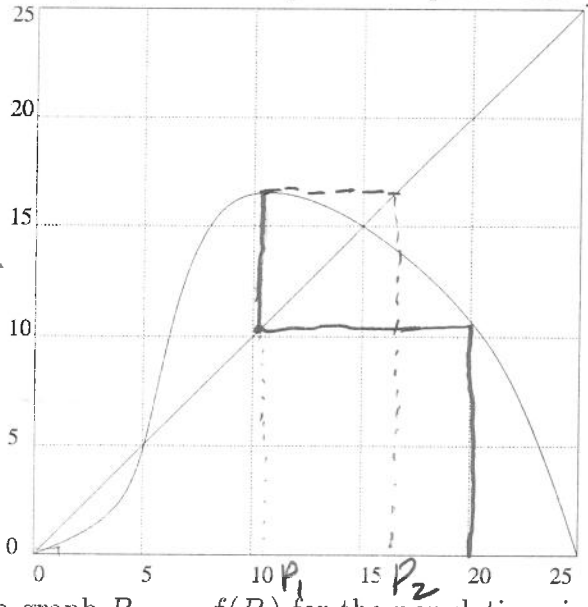
The equation is: $\frac{25P}{1+.3P^2} = P$

(b) What are the equilibrium points? The equilibrium points are: 0, 8.944

Y1 = 25X/(1+.3X^2)
Y2 = X
Xmin = 0
Xmax = 15
2nd calc 5:intersect

X = 8.944

Also 0 is an equilibrium point



The figure above defines a graph $P_{t+1} = f(P_t)$ for the population size of the number of moles in a backyard.

2. If the numbers of moles this year is $P_0 = 20$, give estimates for the number, P_1, of moles next year and the number, P_2, of moles two years from now. Do this by drawing a cobweb diagram on the graph above.

$P_1 \approx$ 10.5

$P_2 \approx$ 17

3. This system has three equilibrium points. What are they?

Equilibrium points are: 0, 5, 15

4. Recall (and from now on you should have this fact memorized) an equilibrium point is ***stable*** if |stable| < 1 and ***unstable*** if |slope| > 1. Use this criterion to determine which of the equilibrium points are stable and which are unstable.

Stable equilibrium points are: 0, 15 Unstable equilibrium points are: 5