Mathematics 172

Quiz 30 **Name:** Key

You must show your work to get full credit.

We look again at the army worm (Mythimna unipuncta) from the last quiz. Let f_t be the proportion of oat fields that are infested with the army worms where t is the number of years after 2,000. This time assume that the colonization all comes from other fields. We model this with the difference equation

$$\Delta f = cf(1-f) - ef$$

where I assume you know the meaning of c and e. We will assume

$$c = .6$$

1. The oat fields are sprayed with an insecticide that insures with a probability of .4 that an infested field does not have any army worms the next year.

(a) Write the difference equation for f. The equation is $\Delta f = .6f(1-f) - .4f$

(b) What are the equilibrium points of this equation?

Solve $\Delta f = f(.6(1-f) - .4) = 0$

$f = 0$ $.6(1-f) - .4 = 0$

$.6 - .6f + .4 = 0$

$-.6f = -.2$

The points are: $0, .3333...$

$f = \frac{-.2}{-.6} = \frac{1}{3} = .3333$

(c) In the long run what percentage of the fields are infested?

Percentage is 33.33%

2. The oat fields are sprayed with an insecticide that insures with a probability of .7 that an infested field does not have any army worms the next year.

(a) Write the difference equation for f. The equation is $\Delta f = .6f(1-f) - .7f$

(b) What are the equilibrium points of this equation?

$\Delta f = f(.6(1-f) - .7) = 0$

$f = 0$ $.6(1-f) - .7 = 0$

$.6 - .6f - .7 = 0$

$-.6f = .1$

The points are: $0, .166667$

$f = \frac{-.1}{-.6} = \frac{1}{6} = .16666...$

(c) In the long run what percentage of the fields are infested?

Percentage is 0%