

Mathematics 172

Quiz #19

Name: Key

You must show your work to get full credit.

Islands off the coast of California are the homes of a species of butterflies. The probability of an island populated by the butterflies having them go extinct is $p_e = .35$ and the probability of an island unpopulated by the butterflies being colonized from the mainland is $p_i = .45$.

1. Let f be the fraction, or proportion, of the islands that are populated at a given time. Write a rate equation for f . (Note that a rate equation should include a $\frac{df}{dt}$ term.)

$$\frac{df}{dt} = p_i(1-f) - p_e f$$

$$\therefore \frac{df}{dt} = .45(1-f) - .35f$$

2. Find the equilibrium point. Equilibrium point is .5625

solve

$$\frac{df}{dt} = .45(1-f) - .35f = 0$$

$$.45 - .45f - .35f = 0$$

$$.8f = .45$$

$$f = \frac{.45}{.8} = .5625$$

3. Draw the graphs of the solutions with $f(0) = .1$ and $f(0) = .9$.

