Mathematics 172

Quiz 31 Name: Key

You must show your work to get full credit.

Here we look at the continuous versions of the equations for metapopulations. Our first difference equation was

$$\Delta f = c(1-f) - ef.$$

The continuous version of this is the rate equation

$$\frac{df}{dt} = c(1-f) - ef.$$

1. For the case where $c = .4$ and $e = .8$ write the rate equation and find the equilibrium point (which will be a number, not an ordered pair).

Rate equation. $\frac{df}{dt} = .4(1-f) - .8f$

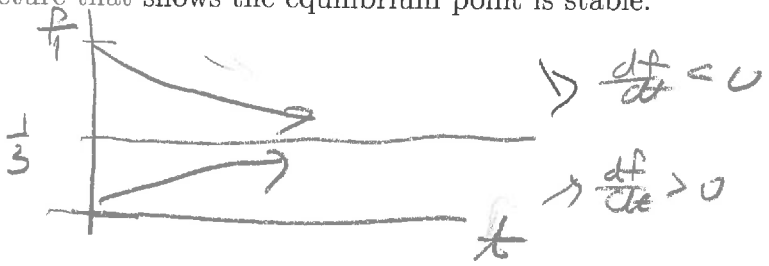
$\frac{df}{dt} = .4(1-f) - .8f$

$= .4 - 1.2f = 0$

$f = \frac{.4}{1.2} = .3333 = \frac{1}{3}$

Equilibrium point: .3333

Draw a picture that shows the equilibrium point is stable.



The other rate equation we had is

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

and the corresponding rate equation is

$$\frac{df}{dt} = cf(1-f) - ef.$$

2. For the case where $c = .9$ and $e = .3$ write the rate equation find the equilibrium points.

Rate equation. $\frac{df}{dt} = .9f(1-f) - .3f$

$\frac{df}{dt} = .9f(1-f) - .3f$

$= f(.9(1-f) - .3)$

$= f(.6 - .9f) = 0$

$f = 0, \frac{.6}{.9} = \frac{2}{3} = .6666$

Equilibrium points: 0, .6666

Draw a picture that shows which equilibrium point is stable.