# Mathematics 172

Name: _____ Key _____

*You must show your work to get full credit.*

Islands off the cost of California are the homes of a species of butterflies. The probability of an island populated by the butterflies having its population of butterflies going extinct is $p_e = .35$. The probability of an island with no butterflies being populated from the mainland is $p_i = .45$.

**1.** Let $f$ be the fraction, or proportion, of the islands populated by the butterflies at a given time. Write a rate equation for $f$. (Note that a rate equation should include a $\frac{df}{dt}$ term and an equal sign.)
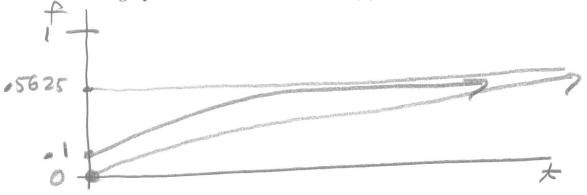
$$\frac{df}{dt} = .45(1-f) - .35f = .45 - .8f$$

**2.** Find the equilibrium point of the equation.

solve

$$\frac{df}{dt} = .45 - .8f = 0$$

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

Equilibrium point is ____ .5625 ____

**3.** Draw the graphs oof the solutions with $f(0) = .1$ and with $f(0) = 0$.



**4.** For the solution with $f(0) = .1$ estimate $f(100)$.

All solution approch the Equilibrium Point

$f(100) \approx$ ____ .5625 ____