Mathematics 172

Quiz 35 Name: Key

You must show your work to get full credit.

1. Duckweed is being used to feed a tank of tilapia. To save space the duckweed is raised in the same tank as the tilapia.

(a) If no extra duck weed is added to the tank, due to the feeding of the fish, the intrinsic growth rate of the duckweed is $r = -.2$ (lb/day)lb. Let $P(t)$ be the weight of the duckweed in the pond after t days. What is the rate equation $P(t)$?

The rate equation is $\frac{dP}{dt} = -.2P$

(b) Now assume that duckweed flows into the tank at a constant rate of S lb/day. What is the new rate equation and equilibrium point.

Rate equation $\frac{dP}{dt} = -.2P + S$

To find the equ. pt solve

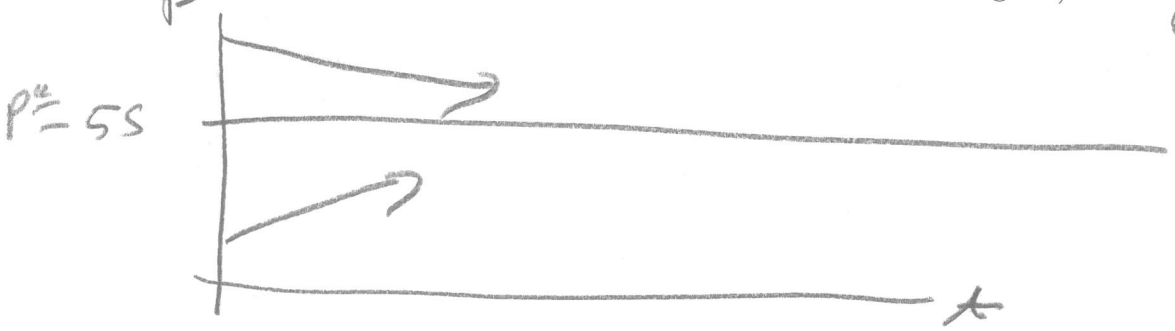
$-.2P + S = 0$

$-.2P = -S$

$P = P^* = \frac{S}{.2} = 5S$

Equilibrium point $P^* = 5S$

(c) Explains why the equation point is stable. (Using a picture is good)



$\frac{dP}{dt} = -.2P + S < 0$ for large P so decreasing

$\frac{dP}{dt} > 0$ for small P

(d) The tank to have a stable duckweed population 1.5 lbs, at what rate, S, should we stock the tilapia pond.

We want $P^* = 5S = 1.5$

so $S = \frac{1.5}{5} = .3$

$S =$ .3 lbs/day

The final is 9:00am on Friday April 29. Please bring a calculator.