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Michael

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1. A) $\frac{\partial H}{\partial t} = rH - bHP$

$$\frac{\frac{\partial H}{\partial t}}{P} = \frac{rH - bHP}{P}$$

$\frac{\partial P}{\partial t} = cHP$

$$\frac{\frac{dP}{dt}}{P} = cHP - \frac{KP}{P}$$

B)

$$\frac{\frac{dH}{dt}}{P} = rH - \frac{bHP}{P}$$

$$rH = \frac{\frac{dH}{dt}}{P} + \frac{bHP}{P}$$

$$rH = \frac{\frac{dH}{dt} + bHP}{P}$$

$$H = \frac{\frac{\frac{dH}{dt} + bHP}{P}}{r}$$

C)

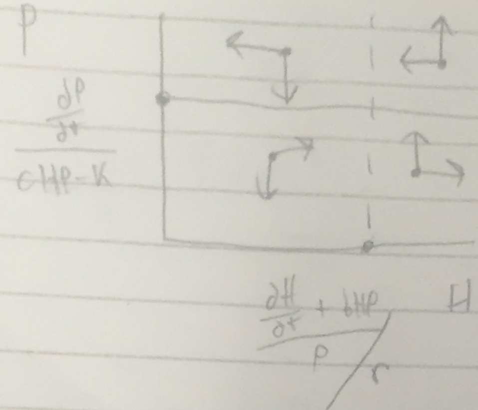
$$\frac{\frac{dP}{dt}}{P} = cHP - \frac{K\cancel{P}}{\cancel{P}}$$

$$\frac{dP}{dt} = cHP^2 - \frac{K\cancel{P}}{\cancel{P}}$$

$$\frac{dP}{dt} = P(cHP - K)$$

$$P = \frac{\frac{dP}{dt}}{cHP - K}$$

d)




e) T = trace → sum of Diagonals → ad + cb

Determinant = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ → ad − cb

$$A = \begin{bmatrix} \frac{dH_1}{dt} / P_1 & \frac{dH_1}{dt} / P_2 \\ \frac{dH_2}{dt} / P_2 & \frac{dH_2}{dt} / P_2 \end{bmatrix}$$

$$\text{Trace} = \left( \frac{dH_1}{dt} / P_1 \cdot \frac{dH_2}{dt} / P_2 \right) + \left( \frac{dH_2}{dt} / P_2 \cdot \frac{dH_1}{dt} / P_2 \right)$$

$$\text{Determinant} = \left( \frac{dH_1}{dt} / P_1 \cdot \frac{dH_2}{dt} / P_2 \right) - \left( \frac{dH_2}{dt} / P_2 \cdot \frac{dH_1}{dt} / P_2 \right)$$

f) This model does not make very good sense to me at all. The second we switch to something different that changes greatly from what we did in class, I feel very lost. I have attempted to make sense of this but have not been able to do so yet. I can assume though that not having an exact form of predation rate would allow for variability in the outcome depending on the form you use, in order to come to proper solutions.

3. $$\frac{dH}{dt} = rH\left[1 - \frac{H}{K}\right] - bHP$$

*adding dens. dep. doesn't
$\Delta$ equation for pred pop.

$$\frac{dP}{dt} = cHP - kP$$

• ~~by adding this pesticide, through intuitive analysis~~
I believe that both the predator and the prey will decrease which may only end up decreasing the predator population. The prey pop. will simply have decreased predation that will be replaced by the pesticide. So for this it seems to depend on the rate.

$$\frac{dH}{dt} = rH\left[1 - \frac{H}{K}\right] - bHP(\text{chemical})$$

$$\frac{dP}{dt} = cHP - kP(\text{chemical})$$

4. a) $$\frac{dH}{dt} = rH - bHP$$

?

$$\frac{dP}{dt} = cHP$$