1C.

Through time increase (t+), the value difference will accumulate from the previous t interval till almost plateau in each trajectory. So the highest variance region will be between the end of linear region to the plateau region. The plateau means almost steady, the variance will stop increasing. But the variance in plateau region is varied in each run, the variance may keep high as the highest or growth and decline.

2D.

Although the product of two factor 0.02 and 50 is 1. But each reaction, 50 multiples twice. rxntot is bigger, in exponential distribution, result in more time point in each trajectory.

3.

$$\frac{\partial A}{\partial t} = D\ \frac{\partial^2 A}{\partial x^2} - \gamma A \quad \text{(PDE1)}$$

$$\frac{\partial R}{\partial t} = D\ \frac{\partial^2 R}{\partial x^2} - \gamma R + P_{Rmax}\frac{A}{K_{AR}+A} \quad \text{(PDE2)}$$

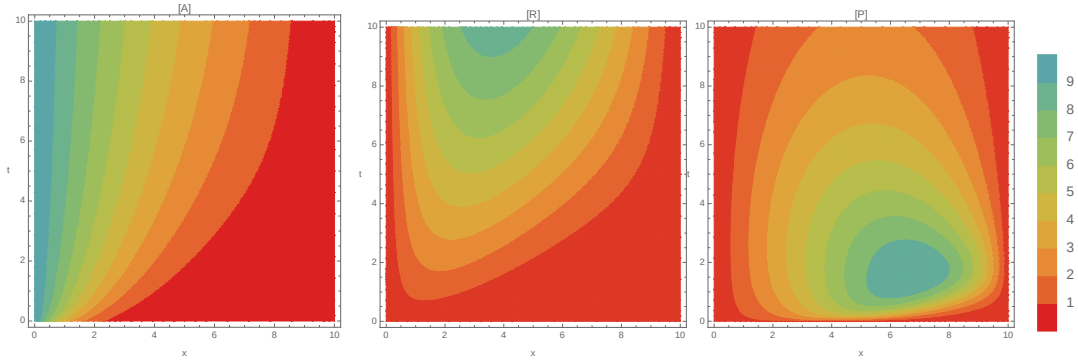
$$\frac{\partial P}{\partial t} = D\ \frac{\partial^2 P}{\partial x^2} - \gamma P + P_{Pmax}\frac{A}{K_{AP}+A}\frac{K_{RP}}{K_{RP}+R} \quad \text{(PDE3)}$$

a.

I just tried different value, for the beginning, I fixed gamma in 0.02, pmax in 50. And tried to change each K. (set each K as 1 at beginning)

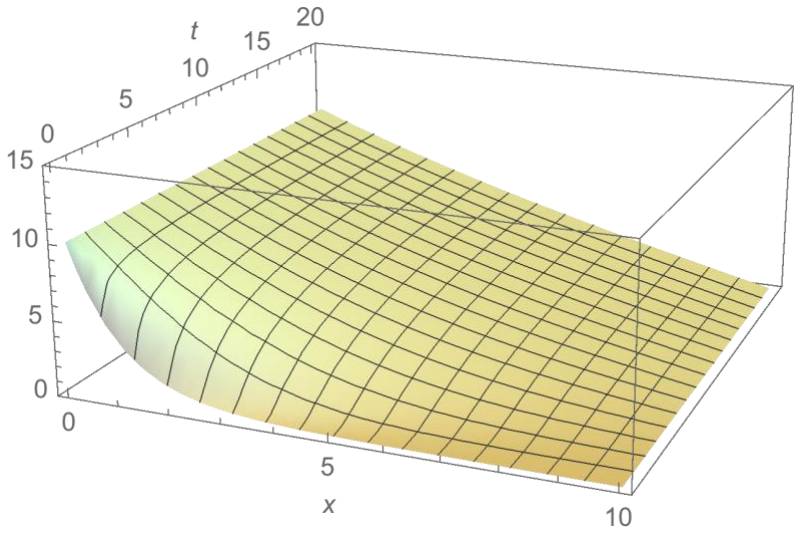
R (x,t) figure would be optimal, when I set K_AR till 100.

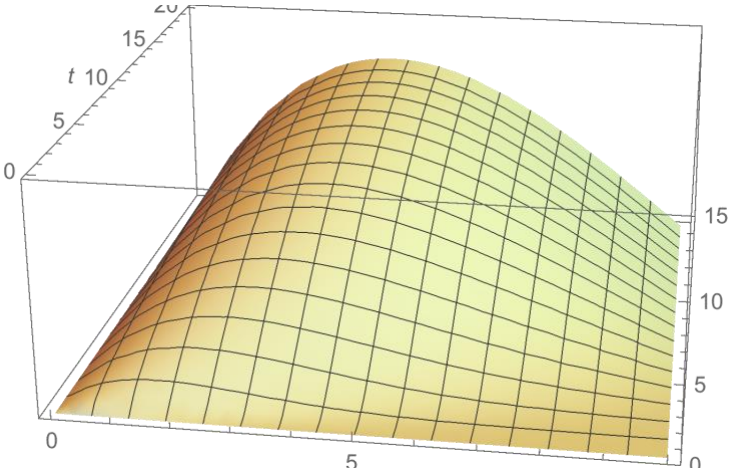
On the opposite, and for third PDE, the rate constant should be small, the figure showed gradient color until the value till 0.05. The further optimize is set K_RP smaller than 0.05, the final value is 0.01.

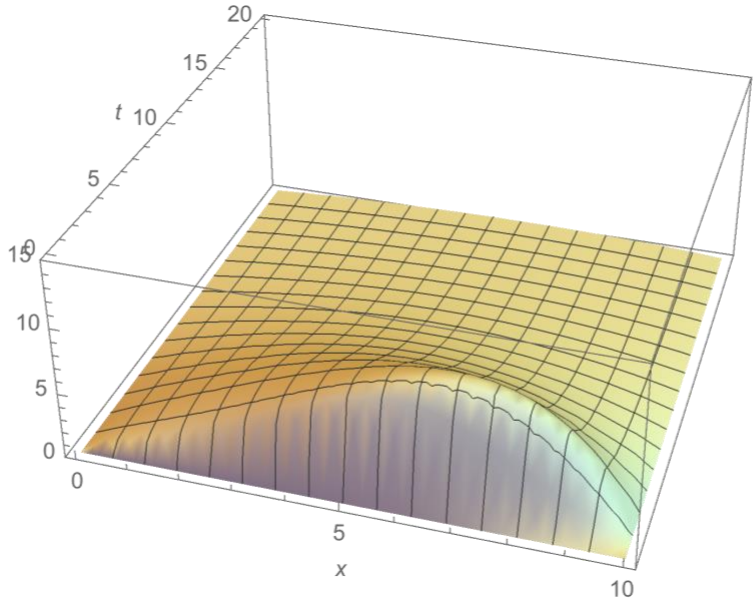


b.

The above each generate each 3D geography figures as following.







the pulse is right at x=8, and P concentration is approximately 8-9.

c. Honestly, I have no idea what was the question asked for? Any hint?