2.) a) A ⇒ activator of A & R production

R ⇒ inhibitor of A production, no effect on R

→ Significance of parameter d_a:
degradation rate constant

A: basal rate ⇒ when $c_a = 0$ & $c_r = 0$...

$$\frac{dc_{a,b}}{dt} = r_{0a}$$

maximal rate ⇒ when $c_r = 0$...

$$\frac{dc_{a,m}}{dt} = -d_a c_a + \frac{r_{0a} + r_a c_a^2}{1 + c_a^2}$$

R: basal rate ⇒ when $c_r = 0$ & $c_a = 0$...

$$\frac{dc_{r,b}}{dt} = r_{0r}$$

maximal rate ⇒ when $c_r = 0$ & c_a large

$$\frac{dc_{r,m}}{dt} = r_r$$

→ b & c done w/ code & in plot document

d) When the system has initial concentration values of c_a & c_r that places it above the c_a nullcline, the system returns to lower values of c_a to the point of 0 for c_a. However, once there is no A species to produce R and R continues to degrade, the system will return to higher values of c_a since less c_r means less inhibition for A production, which leads to R production as well. Thus, the system is at high values of c_a & c_r, repeating the process over again and oscillating.

→ e done w/ code & in plot document