HW #5 Problem 2

Tuesday, May 5, 2020 10:35 PM

a) A is an activator of A & R

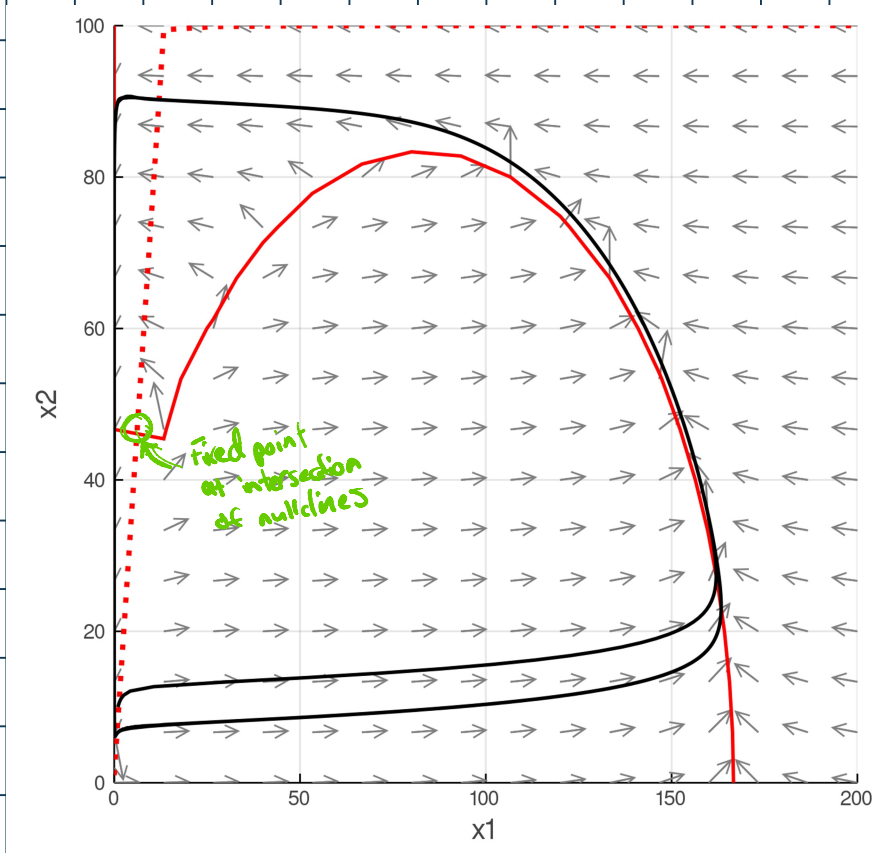
R is an inhibitor of R

d_a refers to the linear rate of degradation of A

The basal rate of A is r_{0a}, the basal rate of R is r_{0r}

The maximal rate of A is r_a & for R it is r_r

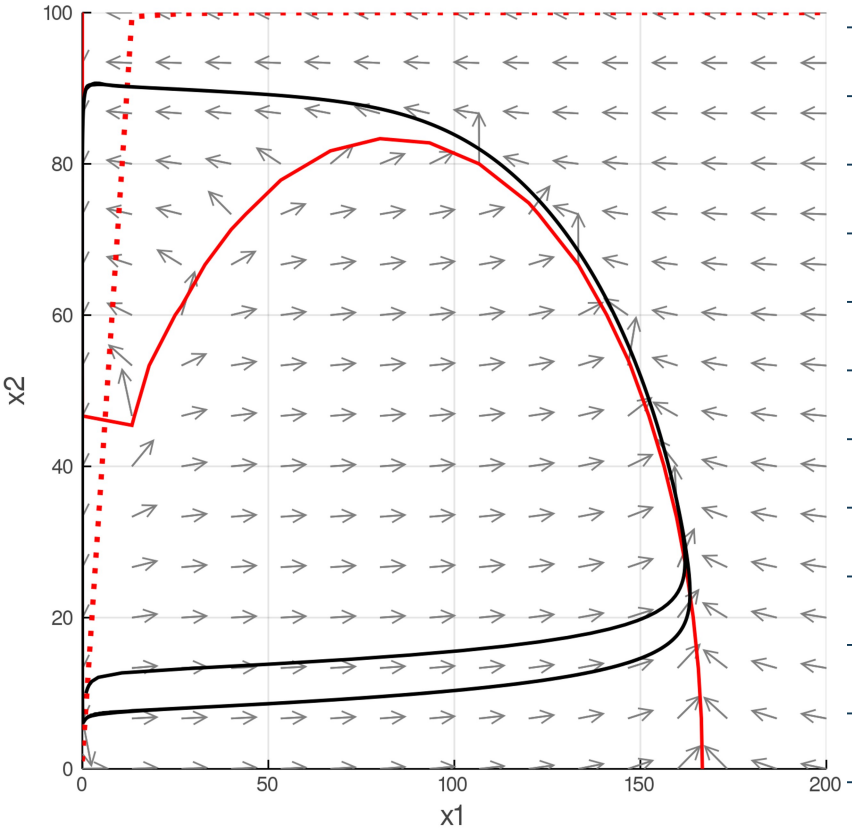
b) Nullclines $\frac{d}{dt} = 0$ Assume $r_{0r} = 1$, $r_r = 100$, $r_{0a} = 100$, $r_a = 5000$, $d_a = 30$ *From part c



The fixed point is unstable as the vectors point away from the fixed point

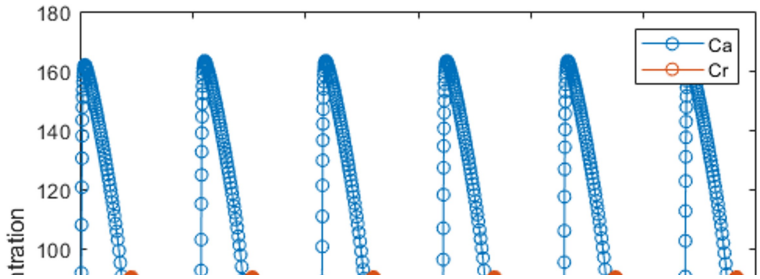
Nuldines in Red

c) The black line marks the representative soln for $C_{a_0}=1$, $C_{r_0}=10$

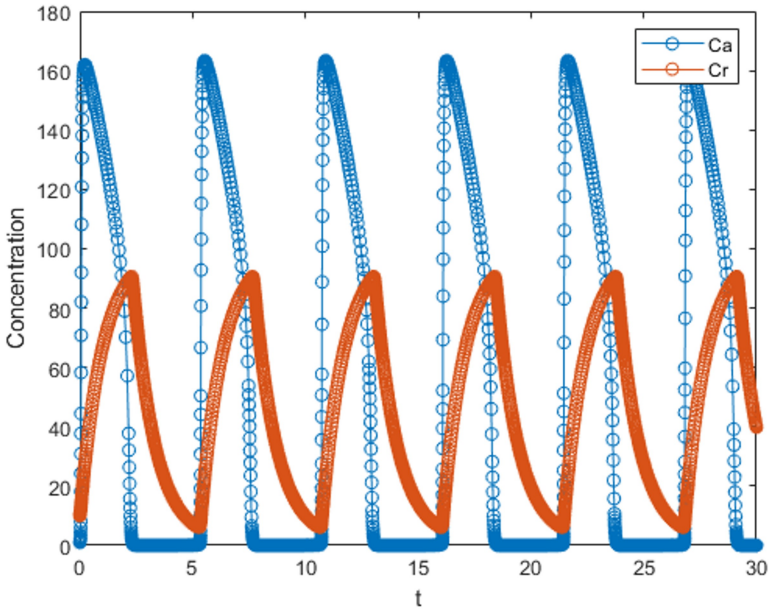


d) Based on the phase diagram the oscillator works by causing a shift in concentration of species 1 while decreasing the concentration of species 2 and there is then a gradual shift where [1] is now decreasing and [2] increases. This process repeats (oscillates) back and forth.

e)



c)


Ca
Cr
Concentration
t
0
20
40
60
80
100
120
140
160
180
0
5
10
15
20
25
30