1. In the (continuous) SIRS model with a population of 1000 and parameters $\gamma = 1.2$, $\nu = 1.2$. For each $\beta = 0.01 \cdot i$, for $1 \le i \le 20$, how many "removed" people are there?

1. i=1 ; R = 10
2. i=2; R = 40
3. i=3 ; R = 90
4. i=4; R = 160
5. i=5 ; R = 249
6. i=6; R = 358
7. i=7 ; R = 487
8. i=8; R = 635
9. i=9 ; R = 803
10. i=10; R = 990
11. i=11 ; R = 1000
12. i=12; R = 1000
13. i=13 ; R = 1000
14. i=14; R = 1000
15. i=15 ; R = 1000
16. i=16; R = 1000
17. i=17 ; R = 1000
18. i=18; R = 1000
19. i = 19; R = 1000
20. i= 20; R = 1000

2. Type a1:=rand(1..100)(): a2:=rand(1..100)():[a1,a2];SEquP(ChemoStat(N,C,a1,a2),[N,C]); 20 times. How often did you get a stable equilibrium? **I got a stable equilibrium 20/20 times.**

3. Run SIRSdemo(1000,400,1,1,0.01,10);

This is a numerical demonstration of the R0 phenomenon in the

SIRS model using discretization with mesh size=, 0.01,

and letting it run until time t=, 10   with population size, 1000, and fixed parameters nu=, 1,
and gamma=, 1 where we change beta from 0.2*nu/N to 4*nu/N
Recall that the epidemic will persist if beta exceeds nu/N,
that in this case is 1/1000
We start with , 400, infected individuals, 0 removed and hence, 600 susceptible
We will show what happens once time is close to 10, beta is , 1/10, times the threshold value
the long-term behavior is

[[9.98, [999.6693512, 0.04464970605]],

[9.99, [999.6721666, 0.04424784393]],

[10.00, [999.6749582, 0.04384959883]],

[10.01, [999.6777263, 0.04345493819]]]

beta is , $\frac{3}{10}$, times the threshold value

the long-term behavior is

[[9.98, [998.8686058, 0.2679278925]],

[9.99, [998.8764375, 0.2660514879]],

[10.00, [998.8842153, 0.2641882307]],

[10.01, [998.8919395, 0.2623380288]]]

beta is , $\frac{1}{2}$, times the threshold value

the long-term behavior is

[[9.98, [995.5661036, 1.464972088]],

[9.99, [995.5885005, 1.457614750]],

[10.00, [995.6107835, 1.450294524]],

[10.01, [995.6329532, 1.443011223]]]

beta is , $\frac{7}{10}$, times the threshold value

the long-term behavior is

[[9.98, [982.9907292, 6.871557578]],

[9.99, [983.0448236, 6.850124744]],

```
  [10.00, [983.0987363, 6.828761355]],

  [10.01, [983.1524679, 6.807467168]]]


         9
beta is , --, times the threshold value
        10

      the long-term behavior is

[[9.98, [944.9550913, 25.07830676]],

  [9.99, [945.0414764, 25.04080455]],

  [10.00, [945.1276722, 25.00337789]],

  [10.01, [945.2136792, 24.96602657]]]


        11
beta is , --, times the threshold value
        10

      the long-term behavior is

[[9.98, [866.8575732, 64.57449614]],

  [9.99, [866.9275067, 64.54449698]],

  [10.00, [866.9972772, 64.51456141]],

  [10.01, [867.0668854, 64.48468924]]]


        13
beta is , --, times the threshold value
        10

      the long-term behavior is

[[9.98, [764.2055840, 117.1693099]],
```

[9.99, [764.2277964, 117.1616555]],

[10.00, [764.2499053, 117.1540354]],

[10.01, [764.2719113, 117.1464495]]]

```
         3
beta is , -, times the threshold value
         2
```

the long-term behavior is

[[9.98, [667.4467215, 166.2827762]],

[9.99, [667.4446531, 166.2847218]],

[10.00, [667.4425717, 166.2866623]],

[10.01, [667.4404774, 166.2885977]]]

```
          17
beta is , --, times the threshold value
          10
```

the long-term behavior is

[[9.98, [588.7326192, 205.7837146]],

[9.99, [588.7278789, 205.7854544]],

[10.00, [588.7231678, 205.7871777]],

[10.01, [588.7184858, 205.7888844]]]

```
          19
beta is , --, times the threshold value
          10
```

the long-term behavior is

[[9.98, [526.3391708, 236.9273141]],

[9.99, [526.3371276, 236.9274194]],

[10.00, [526.3351118, 236.9275155]],

[10.01, [526.3331234, 236.9276024]]]

beta is , $\frac{21}{10}$, times the threshold value

the long-term behavior is

[[9.98, [476.0755911, 261.9954214]],

[9.99, [476.0755589, 261.9947893]],

[10.00, [476.0755398, 261.9941570]],

[10.01, [476.0755336, 261.9935246]]]

beta is , $\frac{23}{10}$, times the threshold value

the long-term behavior is

[[9.98, [434.6820669, 282.6567829]],

[9.99, [434.6827642, 282.6561293]],

[10.00, [434.6834631, 282.6554802]],

[10.01, [434.6841635, 282.6548356]]]

beta is , $\frac{5}{2}$, times the threshold value

the long-term behavior is

```
[[9.98, [399.9447066, 300.0130619]],

  [9.99, [399.9454130, 300.0126472]],

  [10.00, [399.9461153, 300.0122378]],

  [10.01, [399.9468135, 300.0118336]]]


          27
beta is , --, times the threshold value
          10

       the long-term behavior is

[[9.98, [370.3498315, 314.8101124]],

  [9.99, [370.3503056, 314.8099378]],

  [10.00, [370.3507743, 314.8097672]],

  [10.01, [370.3512378, 314.8096006]]]


          29
beta is , --, times the threshold value
          10

       the long-term behavior is

[[9.98, [344.8255549, 327.5761726]],

  [9.99, [344.8257953, 327.5761533]],

  [10.00, [344.8260313, 327.5761363]],

  [10.01, [344.8262630, 327.5761215]]]


          31
beta is , --, times the threshold value
          10

       the long-term behavior is
```

```
[[9.98, [322.5856476, 338.7004341]],

  [9.99, [322.5857299, 338.7004867]],

  [10.00, [322.5858094, 338.7005401]],

  [10.01, [322.5858863, 338.7005943]]]


          33
beta is , --, times the threshold value
          10

       the long-term behavior is

[[9.98, [303.0363872, 348.4783244]],

  [9.99, [303.0363869, 348.4783944]],

  [10.00, [303.0363852, 348.4784644]],

  [10.01, [303.0363821, 348.4785344]]]


           7
 beta is , -, times the threshold value
           2

       the long-term behavior is

[[9.98, [285.7191728, 357.1389626]],

  [9.99, [285.7191408, 357.1390237]],

  [10.00, [285.7191083, 357.1390844]],

  [10.01, [285.7190753, 357.1391447]]]


          37
beta is , --, times the threshold value
          10
```

the long-term behavior is

[[9.98, [270.2735369, 364.8628645]],

[9.99, [270.2735002, 364.8629086]],

[10.00, [270.2734634, 364.8629522]],

[10.01, [270.2734267, 364.8629953]]]

39
beta is , --, times the threshold value
10

the long-term behavior is

[[9.98, [256.4121907, 371.7940209]],

[9.99, [256.4121603, 371.7940490]],

[10.00, [256.4121301, 371.7940766]],

[10.01, [256.4121001, 371.7941037]]]

4. After downloading BOTH DMB.txt and L18.txt from the class web-page run HWgE(100,1000); 10 times. Are the answers close to each other? Can you estimate the prob. that with a random preferance matrix only one genotype will survive in the long run.

1. .548
2. .529
3. .57
4. No sol.
5. No sol.
6. .548
7. No sol.
8. .551
9. .581
10. No sol.

It appears like there is approximately a 40% chance only one genotype will survive for a random matrix.