Homework for Lecture 16 of Dr. Z.'s Dynamical Models in Biology class

Email the answers (as a .pdf file) to

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by 8:00pm Monday, Nov. 3, 2025.

Subject: hw16

with an attachment hw16FirstLast.pdf

1. For the generalized Hardy-Weinberg model given by HWg(u,v,M) where M is a 3 by 3 preferance matrix

dominating alleles →

AA	aa	all stayed
7	12	21

Type

```
M:=RandMat(3,30); T:=HWg(u,v,M); SSSgN(T,[u,v]);
```

40 times and record in how many cases only one of the alleles AA, Aa, aa will survive (i.e. the output is closae to [0,1], [1,0], or [0,0]) and in how many of them they wull also survive.

2. for each of b=c=0.1, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4

Using

```
SSSgN(AllenSIR(a,b,c,x,y),[x,y]);
```

for a=(b+c)/2 , a=(b+c), a=1.5*(b+c), a=2*(b+c), a=10*(b+c), a=100*(b+c)

Confirm, in each case, that in the Linda Allen model, for $a = (b + c)/2$ in the long run there are no infected individuals, but after $a = (b + c)$, they will start showing up. Also confirm that even for large a, they will not all be infected but x_n and y_n tend to some number.

$a = \frac{b+c}{2}$ no infected

$a = b+c$ infected persist

$a = 1.5(b+c)$ infected persist

$a = 2(b+c)$ infected persist

$a = 10(b+c)$ infected persist

$a = 100(b+c)$ infected persist but not everyone

when $a = \frac{b+c}{2}$ there are no infected individuals in the long run but once $a \geq b+c$ infected individuals persist, even for large a values, not everyone will be infected; both x_n & y_n approach finite values.