Homework Lecture 16 Ezra Chechik

1) 21/40 RED = Cases where 1 genotype survives (underlined RED with surviving genotype)
   19/40 GREEN = Cases where all genotypes survive at certain abundance

Iteration 1: AA

$$\begin{bmatrix} 29 & 23 & 15 \\ 26 & 13 & 6 \\ 2 & 27 & 12 \end{bmatrix}$$

Steady state = [.9999999992, .7999999985e-9]

Iteration 2: aa

$$\begin{bmatrix} 14 & 7 & 28 \\ 7 & 3 & 14 \\ 29 & 15 & 15 \end{bmatrix}$$

Steady state = [.5085632845e-33, .9749093655e-16]

Iteration 3:

$$\begin{bmatrix} 8 & 9 & 17 \\ 26 & 18 & 11 \\ 20 & 23 & 13 \end{bmatrix}$$

Steady state = [.1986145182, .5214197860]

Iteration 4: aa

$$\begin{bmatrix} 11 & 5 & 16 \\ 11 & 4 & 27 \\ 22 & 8 & 26 \end{bmatrix}$$

Steady state = [.1314787653e-340, .1244454961e-169]

Iteration 5: AA

$$\begin{bmatrix} 27 & 7 & 2 \\ 12 & 17 & 5 \\ 26 & 3 & 15 \end{bmatrix}$$

Steady state = [1.000000000, -.6511136825e-816]

Iteration 6:

$$\begin{bmatrix} 10 & 17 & 28 \\ 5 & 25 & 1 \\ 30 & 1 & 19 \end{bmatrix}$$

Steady state = [.2956610970, .5451146075]

Iteration 7:

$$\begin{bmatrix} 17 & 28 & 29 \\ 20 & 15 & 24 \\ 5 & 17 & 21 \end{bmatrix}$$

Steady state = [.5500928410, .3949476804]

Iteration 8: AA

$$\begin{bmatrix} 25 & 29 & 2 \\ 2 & 12 & 28 \\ 19 & 21 & 4 \end{bmatrix}$$

Steady state = [1.000000000, .7914219430e-18]

Iteration 9:

$$\begin{bmatrix} 3 & 8 & 16 \\ 9 & 9 & 14 \\ 14 & 21 & 3 \end{bmatrix}$$

Steady state = [.8536612952e-1, .5219484615]

Iteration 10: AA

$$\begin{bmatrix} 28 & 10 & 17 \\ 14 & 12 & 26 \\ 23 & 15 & 7 \end{bmatrix}$$

Steady state = [1.000000000, -.6972498950e-140]

Iteration 11:

$$\begin{bmatrix} 24 & 14 & 13 \\ 22 & 2 & 24 \\ 5 & 27 & 15 \end{bmatrix}$$

Steady state = [.3632274242e-2, .3031559217]

Iteration 12:

$$\begin{bmatrix} 10 & 25 & 11 \\ 12 & 4 & 12 \\ 15 & 30 & 16 \end{bmatrix}$$

Steady state = [.3807647852e-2, .2221871492]

Iteration 13:

$$\begin{bmatrix} 19 & 15 & 26 \\ 10 & 9 & 30 \\ 30 & 27 & 18 \end{bmatrix}$$

Steady state = [.1517208205e-1, .3401869112]

Iteration 14: AA

$$\begin{bmatrix} 25 & 2 & 9 \\ 5 & 26 & 23 \\ 9 & 18 & 23 \end{bmatrix}$$

Steady state = [1.000000000, .1098901100e-9]

Iteration 15: AA

$$\begin{bmatrix} 25 & 11 & 30 \\ 28 & 26 & 24 \\ 8 & 2 & 4 \end{bmatrix}$$

Steady state = [.9999999980, .1668209596e-8]

Iteration 16:

$$\begin{bmatrix} 22 & 21 & 25 \\ 29 & 30 & 1 \\ 20 & 11 & 10 \end{bmatrix}$$

Steady state = [.5807904580, .3704339174]

Iteration 17: AA

$$\begin{bmatrix} 19 & 8 & 8 \\ 14 & 27 & 15 \\ 7 & 11 & 5 \end{bmatrix}$$

Steady state = [.9999999992, .5114246440e-9]

Iteration 18: aa

$$\begin{bmatrix} 9 & 21 & 15 \\ 16 & 11 & 25 \\ 10 & 29 & 28 \end{bmatrix}$$

Steady state = [.1256121508e-34, .1090521488e-16]

Iteration 19: AA

$$\begin{bmatrix} 22 & 8 & 10 \\ 4 & 21 & 19 \\ 8 & 11 & 1 \end{bmatrix}$$

Steady state = [1.000000000, -.4054054054e-9]

Iteration 20: aa

$$\begin{bmatrix} 1 & 20 & 28 \\ 28 & 26 & 7 \\ 8 & 12 & 28 \end{bmatrix}$$

Steady state = [.2295494702e-938, -.3373852241e-469]

Iteration 21:

$$\begin{bmatrix} 7 & 22 & 22 \\ 23 & 2 & 17 \\ 5 & 24 & 16 \end{bmatrix}$$

Steady state = [.5427150870, .4361876580]

Iteration 22: aa

$$\begin{bmatrix} 9 & 18 & 29 \\ 2 & 21 & 12 \\ 3 & 17 & 28 \end{bmatrix}$$

Steady state = [.7398414725e-571, .3252959610e-285]

Iteration 23: AA

$$\begin{bmatrix} 22 & 7 & 22 \\ 17 & 7 & 5 \\ 4 & 30 & 5 \end{bmatrix}$$

Steady state = [1.000000000, .4708828564e-105]

Iteration 24:

$$\begin{bmatrix} 3 & 12 & 27 \\ 6 & 29 & 4 \\ 27 & 20 & 13 \end{bmatrix}$$

Steady state = [.1733330917, .5428410970]

Iteration 25:

$$\begin{bmatrix} 21 & 20 & 19 \\ 25 & 7 & 4 \\ 5 & 25 & 3 \end{bmatrix}$$

Steady state = [.9189037440, .8052747750e-1]

Iteration 26:

$$\begin{bmatrix} 6 & 12 & 2 \\ 8 & 6 & 19 \\ 16 & 13 & 5 \end{bmatrix}$$

Steady state = [.6035227230e-1, .4711966998]

Iteration 27: AA

$$\begin{bmatrix} 27 & 14 & 22 \\ 6 & 24 & 30 \\ 23 & 30 & 26 \end{bmatrix}$$

Steady state = [1.000000000, -.4652850404e-10]

Iteration 28:

$$\begin{bmatrix} 13 & 15 & 16 \\ 16 & 6 & 22 \\ 22 & 10 & 6 \end{bmatrix}$$

Steady state = [.7548302220, .2365637790]

Iteration 29:

$$\begin{bmatrix} 7 & 24 & 25 \\ 16 & 4 & 13 \\ 29 & 27 & 3 \end{bmatrix}$$

Steady state = [.3833021014, .5280305164]

Iteration 30:

$$\begin{bmatrix} 2 & 11 & 5 \\ 21 & 20 & 8 \\ 20 & 6 & 4 \end{bmatrix}$$

Steady state = [.3146199747, .5331476283]

Iteration 31: aa

$$\begin{bmatrix} 29 & 9 & 24 \\ 18 & 5 & 26 \\ 22 & 12 & 22 \end{bmatrix}$$

Steady state = [.1865191270e-129, .4948219328e-64]

Iteration 32: aa

$$\begin{bmatrix} 12 & 12 & 13 \\ 24 & 12 & 11 \\ 1 & 17 & 22 \end{bmatrix}$$

Steady state = [.2515179309e-393, -.2733005740e-196]

Iteration 33:

$$\begin{bmatrix} 2 & 12 & 24 \\ 24 & 27 & 13 \\ 29 & 22 & 2 \end{bmatrix}$$

Steady state = [.2236131392, .5595034095]

Iteration 34: AA

$$\begin{bmatrix} 13 & 12 & 14 \\ 1 & 13 & 7 \\ 2 & 20 & 15 \end{bmatrix}$$

Steady state = [1.000000000, -.1064734846e-9]

Iteration 35:

$$\begin{bmatrix} 14 & 6 & 26 \\ 21 & 6 & 12 \\ 15 & 26 & 9 \end{bmatrix}$$

Steady state = [.4202599244e-1, .4445877674]

Iteration 36: aa

$$\begin{bmatrix} 25 & 1 & 24 \\ 24 & 9 & 19 \\ 13 & 8 & 29 \end{bmatrix}$$

Steady state = [.2207112136e-663, .2482879884e-331]

Iteration 37:

$$\begin{bmatrix} 5 & 21 & 27 \\ 23 & 8 & 16 \\ 29 & 3 & 10 \end{bmatrix}$$

Steady state = [.4282268290, .5144539795]

Iteration 38: aa

$$\begin{bmatrix} 29 & 15 & 18 \\ 2 & 13 & 2 \\ 5 & 5 & 29 \end{bmatrix}$$

Steady state = [.3934369625e-1830, .2261335205e-915]

Iteration 39: AA

$$\begin{bmatrix} 28 & 9 & 21 \\ 8 & 8 & 15 \\ 16 & 9 & 8 \end{bmatrix}$$

Steady state = [1.000000000, .1250000000e-9]

Iteration 40:

$$\begin{bmatrix} 3 & 26 & 12 \\ 10 & 19 & 7 \\ 29 & 23 & 5 \end{bmatrix}$$

Steady state = [.2489565087, .5504940160]

2)

For b=c=0.10:

$avals := [0.1000000000, 0.2, 0.30, 0.4, 2.0, 20.0]$

a = 0.1000:

$[7. \times 10^{-10}, 0.9999999986]$

a = 0.2000:

$[0.0023458826, 0.9952845412]$

a = 0.3000:

$[0.1586702173, 0.6826595654]$

a = 0.4000:

$[0.2379155707, 0.5241688586]$

a = 2.0000:

$[0.4257286974, 0.1485426054]$

a = 20.0000:

$[0.4545407977, 0.09091840559]$

For b=c=0.20:

$avals := [0.2000000000, 0.4, 0.60, 0.8, 4.0, 40.0]$

a = 0.2000:

$[3. \times 10^{-10}, 0.9999999993]$

a = 0.4000:

$[0.0011217441, 0.9977509080]$

a = 0.6000:

$[0.1513070546, 0.6973858908]$

a = 0.8000:

$[0.2266503964, 0.5466992072]$

a = 4.0000:

$[0.3997932150, 0.2004135702]$

a = 40.0000:

$[0.4166666628, 0.1666666747]$

For b=c=0.30:

$avals := [0.3000000000, 0.6, 0.90, 1.2, 6.0, 60.0]$

a = 0.3000:

$[2. \times 10^{-10}, 0.9999999996]$

a = 0.6000:

$[0.0007156888, 0.9985662474]$

a = 0.9000:

$[0.1445190174, 0.7109619652]$

a = 1.2000:

$[0.2161735994, 0.5676528015]$

a = 6.0000:

$[0.3743947189, 0.2512105622]$

a = 60.0000:

$[0.3846153847, 0.2307692308]$

For b=c=0.40:

$avals := [0.4000000000, 0.8, 1.20, 1.6, 8.0, 80.0]$

a = 0.4000:

Error, (in sqrfree) argument must be a polynomial or a rational function in lam

For b=c=0.15:

$avals := [0.1500000000, 0.30, 0.450, 0.60, 3.00, 30.00]$

a = 0.1500:

$[4. \times 10^{-10}, 0.9999999991]$

a = 0.3000:

$[0.0015293689, 0.9969310399]$

a = 0.4500:

$[0.1549131987, 0.6901736030]$

a = 0.6000:

$[0.2321821549, 0.5356356903]$

a = 3.0000:

$[0.4128067433, 0.1743865134]$

a = 30.0000:

$[0.4347824861, 0.1304350281]$

For b=c=0.25:

$avals := [0.2500000000, 0.50, 0.750, 1.00, 5.00, 50.00]$

a = 0.2500:

$[0., 0.9999999998]$

a = 0.5000:

$[0.0008777887, 0.9982409222]$

a = 0.7500:

$[0.1478446271, 0.7043107460]$

a = 1.0000:

$[0.2213159112, 0.5573681774]$

a = 5.0000:

$[0.3869316911, 0.2261366179]$

a = 50.0000:

$[0.3999999999, 0.2000000003]$

$avals := [0.3500000000, 0.70, 1.050, 1.40, 7.00, 70.00]$

a = 0.3500:

$[2. \times 10^{-10}, 0.9999999996]$

a = 0.7000:

$[0.0006012272, 0.9987958353]$

a = 1.0500:

$[0.1413236063, 0.7173527873]$

a = 1.4000:

$[0.2112178323, 0.5775643353]$

a = 7.0000:

$[0.3622938556, 0.2754122889]$

a = 70.0000:

$[0.3703703703, 0.2592592593]$