

Math 20480 – Example Set 08A

Stage	Description	Stage Duration (yr)	Annual Survivor Rates	Annual Fecundity
1	Eggs/hatchlings	1	0.6747	0
2	Small juveniles	7	0.75	0
3	Large juveniles	8	0.6758	0
4	Subadults	6	0.7425	0
5	Adults	> 32	0.8091	76.5

Table 1: Growth Stages of Turtle X

a. Draw the lifecycle graph. You are to consider refinement for the fecundity dictated by census time as discussed in class.

**b.** Write down the system of difference equations describing the population in each growth stages according to the lifecycle graph, survival rates and fecundities.

**c.** Write down the associated Lefkovitch matrix  $M$ .

**d.** Using MatLab, carry out the following computations. Give your numerical values accurate up to four decimal places.

**i.** Find the characteristic polynomial of the Lefkovitch matrix  $M$ .

**ii.** Find the eigenvalues and the associated eigenvectors of  $M$ .

**iii.** Write down the associated canonical matrix  $J$  and find a  $P$  such that  $M = PJP^{-1}$ .

**iv.** Find the continuous growth rate of the the model after a long time.