Part 3

1. Looking at the values of s_x over time forms a sort of downward facing parabola which makes sense. s_x is the fraction of individuals that survive from age class x to age class x+1 and it makes sense that the youngest age group has a lower s_x since infant mortality is often higher than the mortality rates for individuals from the second age group. This is also why s_x peaks around age 40 and then begins to decline because of the natural increase in mortality rate due to old age since with old age comes more occurrences of heart disease, cancer, and just overall degeneration of the human body. The values of f_x follow a similar pattern since fertility follows a similar pattern to survivorship where the peak fertility ages can clearly be seen from the progression of the data. This data is also affected by societal preferences for reproduction age and when to settle down and have a family.

Age	2010	2020	2030	2040	2050
0-9	635000	518750	816240	965650	1341320
10-19	147000	444500	363120	571370	675950
20-29	161500	124950	377830	308660	485660
30-39	162000	145350	112460	340040	277790
40-49	189000	145800	130820	101210	306040
50-59	176000	166320	128300	115120	89060
60-69	136000	140800	133060	102640	92090
70-79	92400	104720	108420	102450	79040
80-89	36000	36960	41890	43370	40980
Total	1734900	1828150	2212140	2650510	3387930
Change		5.375%	21.004%	19.817%	27.822%

2. The largest eigenvalue of the Leslie matrix A is 1.2887 which can be rounded to 1 found in 41 iterations of the power method. This tells me that after about 410 years the population will stabilize. We could get a more accurate reading with a smaller tolerance. I can say the population stabilizes because the iteration converged to an eigenvalue in a reasonable amount of iterations. The eigenvalue tells me how much the population will fluctuate every 10 years and an eigenvalue 1.2887 dictates a small fluctuation and is very close to 1 which means it's very close to stability.
3. Chart with birth rates halved for 2020.

Age	**2030**	**2040**	**2050**	
0-9	549540	747770	886490	100000
10-19	363125	384680	523440	
20-29	377825	308660	326980	
30-39	112455	340040	277790	
40-49	130815	101210	306040	
50-59	128304	115120	89060	
60-69	133056	102640	92090	
70-79	108416	102450	79040	
80-89	41888	43370	40980	
Total	1945424	2245940	2621910	
% Change		15.447%	16.740%	

The largest eigenvalue after cutting the birth rates in half after 2020 is 1.1679 which is even more close to stabilization than before since the eigenvalue is so close to 1. This means fewer fluctuations in population over time. Also this time it only took 38 iterations which means that theoretically it should only take the population 380 years to stabilize versus 410 years in the previous example. In retrospect this shows that the original population was actually not very stable compared to this one.