# Part 3

1. Looking at the values of sx over time forms a sort of downward facing parabola which makes sense. sx 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 sx since infant mortality is often higher than the mortality rates for individuals from the second age group. This is also why sx 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 fx 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.



1. 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.
2. Chart with birth rates halved for 2020.



The largest eigenvalue after cutting the birth rates in half after 2020 is 1.0043 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 29 iterations which means that theoretically it should only take the population 290 years to stabilize versus 410 years in the previous example. In retrospect this shows that the original population was actually very stable compared to this one.