ASSIGNMENT #2
MATH 3820

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China has a long history, and there is less connection the future the time from now, so for the final project I will use the population of China only from Qing dynasty to 2002. After using these data, I would like to find out several formulas that I could use to approximate the future population for China based on different data. I also will try to find out the proportions of male and female in the population. China is the biggest developing country in the world, after I have a rough idea how big is the population going to be and the proportion of the genders; I could start to plan out what kind of business I can consider about when I left school. The mathematical model could easy help me to put up the data and the data flow diagram I need, then I could have advance time to prepare for the business.

The data that I have been collected so far is listed below:

Year	Population (million)	Year	Population (million)
1645	80	1902	370
1662	19	1912	430
1712	25	1949	550
1722	29	1953	602
1741	140	1957	640
1762	200	1964	700
1800	300	1974	900
1812	333	1982	1000

Year	Population (million)	Year	Population (million)
1834	400	1989	1100
1851	432	1997	1295
1892	450	2002	1350

The period between the year 1645 and the year 1662, there was a huge decreasing for the population, the reason for that is the war, the war between Ming dynasty and Qing dynasty. After the war, the rate of population was growing nicely and healthy. At the end of Qing dynasty, China has been invaded by about 10 European countries, and about 80 millions of Chinese lost their life. In the year between 1911-1949, China was be ran by the government called "ZhongHuaMinGuo". The population was growing slowly in this period. The name of China has officially changed to "People's Republic of China" and governed by "GongChangDang" party since October 1st 1949. After 1949, China moved into a peaceful and highly developing period, so that the population was growing in a high and smooth rate. According on the population data of China, I could see that manpower has a more important position on the war in the old time than now. Because at the old time, there was on very powerful weapon, and most powerful "weapon" was the number of army/manpower. And the low medical treatment at the old time was another main reason for pushing down the population. The time after 1949, Chinese living condition has been improved, and there was on war till today. For this

reason, there was space for the population growth. I believe that Chinese population will keep increasing, and in a more acceptable and reasonable rate.

There are several equations I want to use on the data. First, the logistic equation, d/dtN(t)=rN(t)(1-N(t)/k), as in the class. I hope I can use this equation to approximate the population for the year 2002 by using the data up to the year 1997, and then compare to what I have for the year 2002. I hope that would be too much different. Second, for each increasing period, I would like to use some equation like"f (N) =a+bt+ct^2+dt^3" to evaluate the population. Since there were several different periods have the increasing population, but the gap between every two increasing period was so short, so I don't think it's necessary to give a special for each gap. Third, I want to find out an equation could roughly represent the population from the year 1645 to the year 2002. This equation would not be an ideal equation, but it still could tell that the general direction how the population might be in the diagram.

I am planning to discuss 2 cases that affect the population, the government policies and the wars. First, the government policies: in the Qing dynasty, the government did encourage the people to have more baby, because at that time most of the Chinese was farmer, and they did have too much tool to do the work in the farmland, so that required a lot of manpower to do the farmland work; and in the beginning of PRC time, the government also to advocate the "multiple children per family" policy, so the population was growing fast in this two period. Chinese government had been publicly announcing the "one child

per couple" policy in 1980. After the year 1980 the population growth was slow down a little bit, because before the year 1980, there was already 1 billion of people of China. Second, the wars: we known that no matter when, where and how the war start, there always mean losing life during the war period. Since China is a country that has 56 different nationalities, there are always contradiction and argument between them, and something the small argument might start a big war. Manpower was the main and most powerful "weapon" at the old time, so that losing manpower in the war was the main reason for the decreasing of population during the war period. There were 4 main wars for the data. 1, The political power switch from the Ming dynasty to Qing dynasty. It was about the year 1645 to the year 1662. 2, The revolution by the man called Yet-Sen Sun to overthrow the political by Qing dynasty, it happened in the year 1910 to the year 1911. 3, China was be invaded by Japan in the year 1937 to the year 1945. 4, The civil war in between "GongChangDang" party and "GuoMinDang" party during the year 1945 to the year 1949. Of course, population would happen during the war time.

The logistic equation and the equations I match up by the diagrams would easy to be used to calculate the future population. But if there is other influencing factors, like government policy, war or epidemic diseases, and then they would require other equation and way to approximant the population. But input all the data into the diagram is always a good way to approximate the future population.