

# APMA: 0200

## Homework #1

Due Date: September 16, 2015

1. The following table quotes the United States population (measured in millions of people) taken from the United States Census Bureau:

Year	$N \times 10^{-6}$
1790	3.93
1810	7.24
1830	12.87
1850	23.19
1870	39.82
1890	62.95
1910	91.97
1930	122.78
1950	150.70
1970	208.0
1990	249.62
2010	309.34

- (a) Using Matlab plot this data. Just looking at the plot of the data can you deduce what kind of growth the population undergoes? I.e. is it exponential or something else?
- (b) Test the applicability of both the simple exponential growth model and the logistic model to this data. To do this you will need to use the data to determine the parameters in the model. That is you need to determine things like  $N_0$ ,  $r$ , and  $\kappa$ . Using Matlab plot the results of these models and compare them with the data. Which of these models, if any, do you think best fits the data? Can you explain why one model is “more accurate” than the other? If neither of these models is valid can you explain explain why they fail?

2. The following data represents data collected from the population growth of the one-celled organism *Paramecium aurelia*.

Day	$N$
1	2
2	7
3	25
4	68
5	168
6	138
7	190
10	122
11	280
12	260
13	300

- (a) Using Matlab plot this data. Just looking at the plot of the data can you deduce what kind of growth the population undergoes? I.e. is it exponential or something else?
- (b) Test the applicability of both the simple exponential growth model and the logistic model to this data. To do this you will need to use the data to determine the parameters in the model. That is you need to determine things like  $N_0$ ,  $r$ , and  $\kappa$ . Using Matlab plot the results of these models and compare them with the data. Which of these models, if any, do you think best fits the data? Can you explain why one model is “more accurate” than the other? If neither of these models is valid can you explain explain why they fail?