Homework Due Wednesday Jan 26

1. Do the Pfaff module on Global Temperature. The data on temperature is contained in the same excel file that we used for the CO₂ levels. Write up your answers completely. Use complete sentences. Explain what your variables represent and what your units are. The write up should be self-explanatory.

Hand in your answer sheet from the CO₂ module; it won’t be graded but I would like to check what you did.

2. Look through the data sets/modules on the Pfaff web page and choose one module that you think is interesting. Write a short description about what the module examines and why you think this would be a fun/interesting/good module to study. Put your write up into the Discussion Board. Feel free to use your best persuasive writing style. We will vote on which modules to do for the following week’s homework on Friday.

3. a. Find a solution of the Differential Equation

   \[ \frac{dy}{dt} = 3y \]

   that satisfies the initial condition \( y(t=0) = 7 \). What is the value of \( y(t=2) \)?

b. We wish to find a function that satisfies the values \( y(0) = 2 \) and \( y(2) = 6 \) and that satisfies the differential equation

   \[ \frac{dy}{dt} = ky \]

   for some unknown number \( k \). Find the function \( y(t) \). What is the value of \( y(3) \)?

4. We wish to model the US population. We assume that the population growth is modeled by the differential equation

   \[ \frac{dP}{dt} = kP. \]

From census data, we know that in 1790, the population was 3.9 million and in 1800 the population was 5.3 million.
a. Find a function $P(t)$ that solves the differential equation and satisfies the two given conditions. What are your units for $P$? Describe clearly the units and definition of the variable $t$.

b. What value does $k$ have to have?

c. Create a table that gives the values of $P(t)$ every ten years starting in 1790 and going until 2050 (i.e. 1800, 1810, 1820, .... 2050).

d. How accurate do you think this model is as compared to the actual US population values?