Mathematical Models, Spring 2003

Project #2

Heart Rate of Birds and Mammals

DUE DATE: Friday, Feb. 21st, in class.

Assignment: Complete Projects 2 and 3 from the text in Section 2.3 (pp. 85-86)

The goal of this project is for you to use the tools we have developed in the course thus far to come up with a model relating the heart rate of birds and mammals to their weight. A cursory glance at such a problem might suggest that the larger the animal, the bigger the heart rate (pulse rate) must be in order to pump enough blood throughout the body. This is not the case, as the data suggests. The relationship is an **indirect** one rather than a **direct** one. Part of your task is to explain why. You should hypothesize a model, test and revise it using the given data, and then apply it to a species not listed in the table. More specifically, find the weight of a bird and of a mammal not listed in either table and predict what the heart rate would be using your model.

Some Tips: Start by answering part (a) of Project 2. You can formulate a model using the given assumptions without using the data. Note that here you are asked to find a model relating blood **flow** to weight. Blood flow is measured in volume/minute. You may assume that blood flow through an organ is proportional to the product of the pulse rate and the volume of the organ. Your model from part (a) should help you construct a model for part (b). Be sure to list any assumptions you make in constructing your models. For example, where is geometric similarity used?

It is **required** that you work in a group of two or three people. Any help you receive from a source other than your lab partner(s) should be acknowledged in your report. For example, a textbook, web site, another student, etc. should all be appropriately referenced at the end of your report. The project should be typed although you do not have to typeset your mathematical notation. For example, you can leave space for a graph, computations, tables, etc. and then write it in by hand later. You can also include graphs or computations in an appendix at the end of your report. Your presentation is important and I should be able to clearly read and understand what you are saying. Spelling mistakes and sentence fragments, for example, should not occur. Only one project per group need be submitted.

Read all of the directions carefully. You do not have to include an introduction in your report, although a **conclusion** which states what you learned from the project and further questions you might like to investigate are expected. Remember: A well-written report with a few tables and graphs to illustrate key points is far better than a sloppy report with too many figures.