Find a data set of interest to you that can be modeled well by a linear function, and create the model:

- clearly define your input and output variables;
- create a scatterplot for the data (this plot should exhibit little if any curvature so that a linear model is appropriate) and label it properly;
- determine the model formula and the range of values of the input for this model;
- use the model to answer some questions about the underlying phenomena that is being modeled; these questions should include at least each of the following items:
  - identify the slope and y-intercept of the model, then interpret the slope and at least one of the two intercepts (x- or y-intercept) in the context of the model;
  - compute at least one interpolated value and discuss the expected reliability of the corresponding estimate;
  - compute least one extrapolated value and discuss the expected reliability of the corresponding prediction.

Write up these results in a single document, and submit this report as an attachment to an email to Dr. Otero (otero@xavier.edu), or stapled together in a printed form, by 5pm Friday, September 26, 2003.

Phase I: Data Collection

Think about something which interests you (say, a topic relating to your major field of study) and about which you can formulate some quantitative mathematical model. (For instance, what's going on in the world, the country, the region right now? Thinking about this could easily lead to a data set that can be located in a recent edition of a newspaper or issue of a news magazine.) Leave yourself room for flexibility here, as it may take a while for you to settle on your topic, depending on what sort of data you are able to find to form the basis of your research. If some choice of topic turns out to be unworkable, try something else.
Here are some suggestions that might help you:

- There are some interesting project ideas in the text. Look for them at the ends of the chapters.
- Some exercises in the text (problems at the end of each section) are about interesting topics as well. **Do not, however, take data from one of the homework problems I have assigned you.**
- Almanacs are endless sources of numerical data.

Next, refine your topic (*xu.tutor* may be of assistance here; see part one of this online tutorial designed by Xavier librarians:

www.xavier.edu/library/xututor/.)

Then settle on the data you will use for the analysis. Make sure to keep a record of citations for your data, as you will need to include it in your report.

**Phase II: Modelling the Data**

Now that you have your data set, use the techniques you’ve learned (see Chapter 1 of the text) to find a linear model for your data...

Begin to create a document that will describe what the aim of your project is, what the data set you have collected is measuring, and where it came from. Define your variables. Make a scatterplot (see the online tutorial at www.academ.xu.edu/its/math/scatterplot/)

for some tips on how to do this in *Excel* or *Maple* software). The data should be such that a linear model is appropriate; there should be no clear curvature in the plot of points. (If there is, you probably want to start over with a different data set!) Find a linear model for your data, and specify the range of values for the input variable that makes sense for the model.
Phase III: Data Analysis

Use the data and model you have to answer the questions posed in the project instructions at the top of this document. You might discover that you are led to make conclusions unrelated to the questions you had originally when you began Phase I. That's okay; include a description of the interesting things you notice now. However, if you can answer the questions you initially posed, or even restricted versions of those questions now is the time to do it.

Identify the slope and y-intercept of the model. You may also find it important to identify and interpret the x-intercept as well. Calculate at least one interpolated value of the function, and at least one extrapolated value. Interpret these quantities in the context of the model and relate them (if possible) to your earlier questions.

Include this analysis in the document you began writing in Phase II. However, don't just stick it onto the end of what you have (well, OK, you might start by doing that, but now change it)—mix your analysis in with the opening discussion of your models, so that your project makes coherent sense to a reader. Your introduction should describe the data and foreshadow the main analysis, and your conclusion should reflect and recap the results of your investigation.

Phase IV: Submission

Send this document in .pdf form to Dr. Otero at otero@xavier.edu as an attachment to an email (then print a copy for yourself), or stapled together in a printed version, by 5pm, Friday, September 26, 2003.

Comments on Mathematical Writing and Typesetting

There are some common problems which arise when learning how to write mathematics. I recognize that you have almost certainly not done this before, and that this is probably new to you.
(1) Technology -- Your report must be computer-processed. This includes any pictures or graphs that accompany the report. I should see nothing handwritten on your paper. Here are fixes for some standard difficulties... Want to square a variable? Use the superscript text command to format the exponent. Need an equation? In MSWord, there's an Insert Object -> Equation command. MSWord also has a picture-drawing utility, which you can use to make graphs and such. You can create equations, graphs, pictures, etc. in Maple (available on the campus network) and move them into your paper. (This works differently on Mac and PC platforms.) Special symbols can often be found in a "Symbol" font. Don’t be intimidated by using software for the first time--there’s a first time for everything, and it is a valuable skill to be proficient in many kinds of presentation software.

(2) Format -- There should be an introduction, which consists of a concise statement of the problem or situation, a body, which often consists of a discussion and solution of the problem or situation, and a concluding statement, which places the solution in context. (Examples of common conclusions: "This amount is realistic because..." or "...which is what we expected because...") Don’t label sections as corresponding to parts (a), (b), etc. of a textbook exercise, if indeed the project came from a textbook exercise.

(3) Writing style -- The style of your writeup should be somewhat formal. Your reader will not have a textbook handy when perusing your paper, so don't refer to your problem in such a way as to confuse the reader. For example, restate the problem, but do not quote it directly. ("Find the y-intercept of the line" becomes "Suppose we wanted to find the y-intercept of the line.") Similarly, if your chosen problem has several parts, don't list them at the beginning of the paper; bring them up as they occur in the course of the analysis. And, because you are controlling the flow of your writing, you can discuss the parts in a different order than they might be presented in the textbook (if that's more convenient for you)!

You don't need to have intro and conclusion paragraphs, but you should have a couple of sentences on each end that serve as a frame for the problem. (You don't want people to be confused at the beginning or wonder what happened to the punch line of the project.) One good way to end is to make a statement that ties together a few parts of the problem.