

Math 225 Project 10/16/06

Dr. Minkoff

- **Goal:** Investigate a physical process which is important in your major field and which is modeled by an ordinary differential equation.

- **Requirements:** You should form a team of about 3 students from class who have the same major and/or interests as you. The project will consist of investigation of the problem and associated differential equation, and you will be graded on **either** a 10-minute class presentation or a short writeup.

Your team will turn in one report as a group. And one individual should present the results to the class. The chosen speaker should practice the presentation for the other team members, making sure it can be given in 10 minutes and that it is well organized. Presentations must be done with slides, and you will give a copy of your slides to me for grading.

- **Dates:** Your topic and team must be approved by me by November 2.

The written reports are due at the start of class November 21, and the in class presentations will take place November 21.

- **Grade Information:** The project is 15% of your final grade for the class. You will be graded on both content (how well did you investigate and understand the problem you chose?) and your presentation or writeup (can others understand what you did)?

- **Writeup Requirements:** The written report should be 2–3 pages long. Both the in-class presentations and the writeups should contain the following information:

1. Background and motivation for the problem you investigated. What phenomenon is modeled by your differential equation?
2. Why is this problem/process of interest (in general and to your team specifically)?
3. What is the related differential equation?
4. What is known about the solution to this differential equation?
5. Can you solve it analytically or numerically? If not, can you solve a related simpler problem? If so, do so!
6. Discuss what the solution means for your problem/process of interest.

7. Summarize your investigation and resulting discoveries. Are there other differential equations you could investigate related to this problem?

8. Bibliography

• **References:** You can use the following resources to investigate your problem: professors in your major, other professionals working in your field, textbooks, any resources available at the library, and the web. However, I expect you to have used at least two sources which do **not** come from the Internet. You **must** list all your sources in your report bibliography.

• **Possible Project Topics:**

1. Learning theory models.
2. Epidemic models for the spread of disease.
3. Curves of pursuit
4. Chemical reactions
5. Pendulum models
6. Electrical circuits
7. The path of an electron
8. Beams and columns
9. Richardson's arms race
10. Lanchester's combat models
11. Predator-Prey models for interacting species
12. Pollution in the Great Lakes
13. Van der Pol's Equation