

# Math 1270 Projects

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The project that you are required to do for this course involve using differential equations to model some sort of phenomenon in which you are interested. The phenomenon does not even have to be real (eg modeling vampires as a predator-prey/disease model) but should involve some sort of effort in developing the equations. The projects should consist of several parts:

1. Introduction. Here you should state the system you want to study and the aspects of it that you want to explain. For example, suppose you wanted to study the driven pendulum. Then in this section, you should tell me about the problem and what sorts of phenemona that you see (eg chaos) (1 page)
2. Derivation of the model. In this section, you should write down the equations that you want to simulate. You should also try to justify the equations. So, in our pendulum example, I would write down the differential equation, explaining what all the variables are. (1-2 pages)
3. Simulation/Analysis. In this section, you should simulate or analyze the equations - linearize them, look at stability, etc if possible. Otherwise, you can simulate them for different values of parameters. If you fool around with different parameters, make sure you tell me what these correspond to in the physical system. In the driven pendulum, I might vary the amplitude and frequency of the driving force. (several pages with figures)
4. In the last section, you should connect the output of the simulation/analysis with the behavior of the system. Thus, in the pendulum example, you would compare the simulations with the behavior that is seen in the pendulum. In the case of a completely fantastical model (like the vampire), then you would try to interpret the simulation results in terms of predicted behavior. Finally, you may want to point out shortcomings or simplifications that you made and how the model could be improved. (1-2 pages)