

**This assignment is due Thursday, March 9, 2000, at the beginning of lab.**

This assignment has two parts. Your assignment is to write a one page report answering both these questions.

- Begin your report by stating Newton's Law of Cooling in one clear sentence.
- Using Newton's Law of Cooling, solve the following problem.

Each morning you enjoy a cup of coffee before you leave for work. One particular morning, you get up and make a 12 oz cup of  $140^{\circ}F$  steaming hot coffee. Unfortunately, you are running late and must take a 5 minute shower. You enjoy your coffee as hot as possible, but it must have 1 oz of milk in it. You keep your milk at  $50^{\circ}F$  in the refrigerator.

The question is: Should you put your milk in the coffee before you take your shower, or should you leave the milk in the fridge while you shower and then add the milk when you are finished showering?

Your apartment is maintained at a constant temperature of  $65^{\circ}F$  and your coffee maker manual states that the constant of proportionality for coffee (whether mixed with milk or not) is  $-0.04$ .

### Various Instructions

Please observe the following instructions:

1. This is not an easy problem to solve. A few hints may help.
2. It is necessary to formulate TWO different initial value problems; one for each case. In your report, be sure to include these two IVPs as well as their solutions, but do NOT show your work leading to the solutions.
3. You may assume that when coffee and milk are mixed, the temperature of the resulting mixture changes immediately to the (weighted) average of the two temperatures. For example, mixing 2 oz of  $130^{\circ}F$  coffee with 1 oz of  $100^{\circ}F$  milk results in a  $120^{\circ}F$  mixture.
4. Your report should be a one page typed explanation of the solution to this problem (although any equations may be handwritten). You are NOT to simply hand in a string of equations and numbers. You ARE to hand in a clear and articulated solution to the problem in which you logically explain which method of adding milk will ensure the coffee is hottest after 5 minutes.
5. **This report must be jointly written by all members of your lab group.** "Switching off" who writes the weekly paragraphs is considered academic dishonesty and will be punished as such. Your lab group should meet to discuss the problem, write a draft, pick apart each sentence, rewrite as necessary, and proofread until the report is to everyone's liking and understanding.