Section Project

A pharmaceutical company has hired your team (up to three members) of mathematically minded consultants to design dosage programs for a new drug the company has been developing. Preliminary drug studies have found three important constraints that are necessary for you to design a safe, effective dosage program:

- Studies has shown that in an average patient, the drug decays to 10% of its initial bloodstream concentration after 72 hours.

- The drug requires a minimum bloodstream concentration of 30 mg/kg in order for the drug to be effective.

- The drug becomes toxic to the patient if the concentration in the bloodstream is above 300 mg/kg.

Design a safe, effective dosage program (dosage frequency and concentration amount) and submit a report discussing your program. Your report should include a discussion of:

- how the concentration of a single dose decays as a function time,

- a dosage program that specifies the dosage frequency and amount,

- a plot of the concentration in the bloodstream for a patient following the dosage program,

- the long-term evolution of drug concentration in the bloodstream of a patient,

- and an estimate of the amount of drug that is metabolized by a 60kg patient in the first week.

Project Rubric

- Mathematical Content [70 points]

  - The concentration decay of a single dosage is correctly determined. [10 points]

  - The dosage program qualifies as a safe and effective regiment. [20 points]

  - The long-term behavior and bounds of the drug concentration is identified and mathematically justified. [20 points]

  - The dosage program includes an estimate of the amount of drug metabolized in the first week of the program who weighs 60kg. [20 points]

- Report [30 points]

  - A derivation of the proposed dosage program is appropriately addressed.

  - A plot of the concentration of the drug in the bloodstream for the designed program is produced using technology.

  - The report is written in English, well-organized, and easy to follow. Computations are presented neatly by hand or typed.