

Portfolio Assignment:

Modeling the Amount of a Drug in the Bloodstream

Type II, Mathematical Modeling

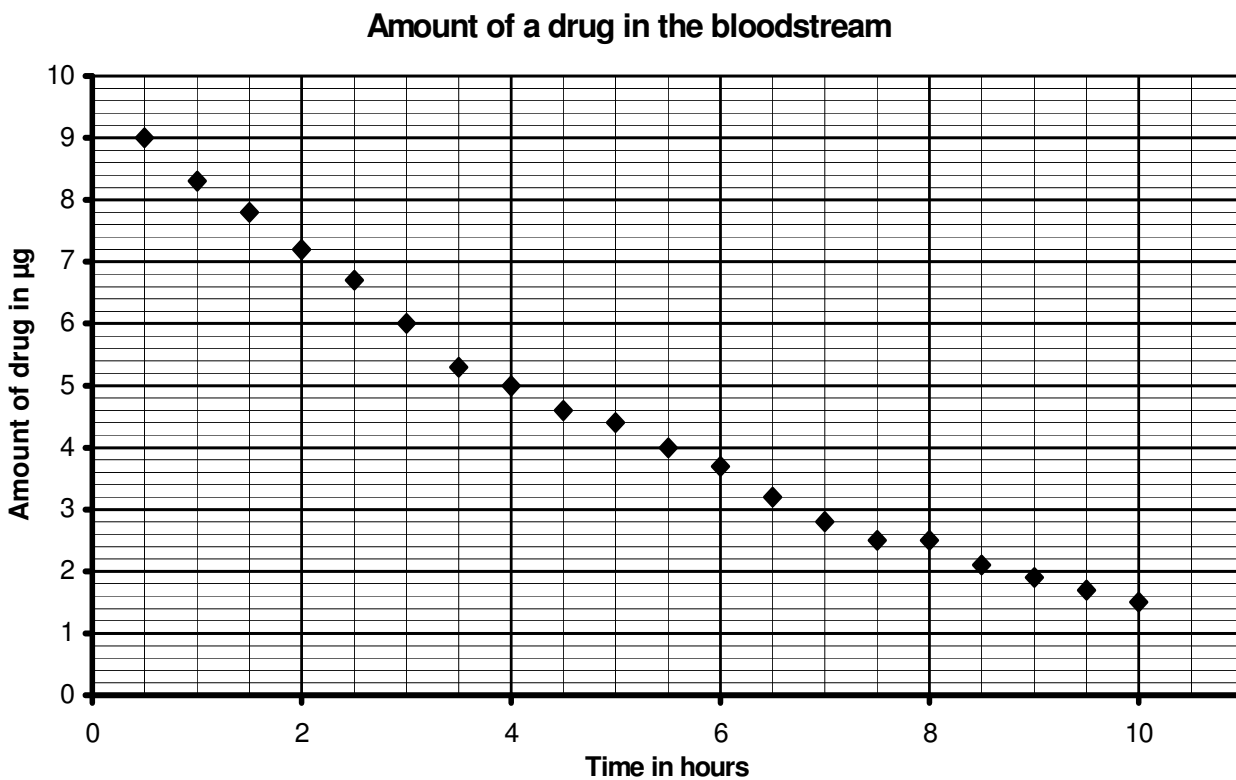
Due date: Friday, December 2, 2005

This assignment will be assessed against all six criteria (for IB students) and is worth 100 points. You must show your analysis and communicate your thinking clearly. Be sure to communicate where and how you used technology so that you can score well on that criterion.

As part of your IB portfolio, this assignment must represent entirely your own work. **You may not discuss it with anyone other than the teacher outside of class time.** To verify that you have followed these requirements, sign the statement below after completing the assignment, and attach this handout to the front of your work.

This portfolio assignment represents my own work. I did not seek or receive any unauthorized assistance.

The graph below records the amount of a drug for treating malaria in the bloodstream over the 10 hours following an initial dose of $10\mu\text{g}$.



It seems that the rate of decrease of the drug is approximately proportional to the amount remaining.

Part 1

1. Use this information to help you find a suitable function to model this data.
2. Produce a graph of your function and compare your graph to the one above.
3. Comment on the suitability of your model.

Part 2

A patient is instructed to take $10\mu\text{g}$ of this drug every six hours.

1. **Sketch** by hand a diagram to show the amount of the drug in the bloodstream over a 24-hour period and state any assumptions made.
2. Use your graphing calculator or graphing software and your model from part A to draw an accurate graph to represent this situation.
3. State the maximum and minimum amounts during this period.
4. Describe what would happen to these values over the next week if:
 - (a) no further doses are taken
 - (b) doses continue to be taken every six hours.