

MATH 122: TAKE-HOME QUIZ 1

Name(s): _____

This assignment is due at the BEGINNING of class on **October 11, 2017**. You may work with ONE other student. If you work with another student, please hand in only **one** paper with **both** of your names. Show **all** work to receive full credit. Make sure your work is organized, written neatly, and stapled. Messy, unstapled, and papers with notebook frills will not be accepted. *This will count as TWO quiz grades.*

Problem 1: The newspaper article below is from *The New York Times*, May 27, 1990. Fill in the three blanks. (For the first blank, assume that daily compounding is essentially the same as continuous compounding. For the last blank, assume the interest has been compounded yearly, and give your answer in dollars. Ignore the occurrence of leap years.)

213 Years After Loan, Uncle Same Is Dunned

By Lisa Belkin

Special to The New York Times

SAN ANTONIO, May 26 - More than 200 years ago, a wealthy Pennsylvania merchant named Jacob DeHaven lent \$450,000 to the Continental Congress to rescue the troops at Valley Forge. That loan was apparently never repaid. So Mr. DeHaven's descendants are taking the United States Government to court to collect what they believe they are owed. The total: _____ in today's dollars if the interest is compounded daily at 6 percent, the going rate at the time. If compounded yearly, the bill is only _____.

Family is Flexible

The descendants say that they are willing to be flexible about the amount of a settlement and that they might even accept a heartfelt thank you or perhaps a DeHaven statue. But they also note that interest is accumulating at _____ a second.

Problem 2: *The following is a medical case study drawn from an actual episode in the clinic of David E. Sloane, M.D.*

During surgery, a patient's blood pressure was observed to be dangerously low. One possible cause is a severe allergic reaction called *anaphylaxis*. A diagnosis of anaphylaxis is based in part on a blood test showing the elevation of the serum *tryptase*, a molecule released by allergic cells. In anaphylaxis, the concentration of tryptase in the blood rises rapidly and then decays back to baseline in a few hours.

However, low blood pressure from an entirely different cause (say from a heart problem) can also lead to an elevation in tryptase. Before diagnosing anaphylaxis, the medical team needs to make sure that the observed tryptase elevation is the result of an allergy problem, not a heart problem. To do this, they need to know the peak level reached by the serum tryptase. The normal range for the serum tryptase is 0-15 ng/ml (nanograms per millileter). Mild to moderate elevations from low blood pressure are common, but if the peak were three times the normal maximum (that is, above 45 ng/ml), then a diagnosis of anaphylaxis would be made.

The surgeons who resuscitated this patient ran two blood tests to measure T_r , the serum tryptase concentration; the results are in the following table. Use the test results to estimate the peak serum tryptase level at the time of surgery assuming that tryptase decays exponentially. Did this patient experience anaphylaxis?

t hours since surgery	4	19.5
T_r concentration in ng/ml	37	13