

Math 129 Sect. 20
Midterm 2 Practice Problems
Oct. 9, 2007

- **Sect. 7.8 Improper Integrals:** 1, 3, 8, 13, 19, 23, 34
- **Sect. 8.1 Areas & Volumes:** 7, 15, 20
- **Sect. 8.2 Geometry:** 3, 5, 11, 17, 29, 33
- **Sect. 8.4 Density and Center of Mass:** 3, 9, 11, 13, 21
- **Sect. 8.5 Work, pressure, etc.:** 5, 7, 11, 17, 23, 27
- **Sect. 9.1 Sequences:** 1, 3, 5, 7, 9, 11, 13, 15, 17, 23, 25, 27, 29, 31, 49, 53
- **Sect. 9.2 Geometric Series:** 1, 3, 5, 9, 25, 28

Problem. The half life of a drug in the human body is 6 hours. That is, if a patient is given 20 mg of the drug, only 10 mg will remain in her system after 6 hours.

1. Assume that t hours after one dose of A mg, the amount of drug which remains is Ae^{-bt} . Find the value of b .
2. Suppose the patient is given A mg of the drug every T hours. Let Q_n be the amount in her body just after the n th dose. Find a recursion relation for Q_n in terms of Q_{n-1} , A , and T . (You will need the value of b you found above.)
3. Let Q_n be as above. Find an explicit expression for Q_n . That is, find Q_n in terms of just n , A , and T .
4. After a large number of doses, the amount Q_n will approach the limit $Q = \lim_{n \rightarrow \infty} Q_n$. Find an expression for Q in terms of A and T .
5. It is dangerous for anyone to have more than 100 mg of the drug in their system at any given time. If the amount A we administer each time is 20 mg, and if we want to make sure that the limiting amount is $Q = 50$ mg (so the patient does not overdose), how often should we administer the drug? *Hint: in your answer from Part 4, set $A = 20$ and $Q = 50$, and solve for T .*