

# Preparing Midterm

The first midterm will be held on Monday, April 27, room 380-380W, 7-8:30pm.

The midterm will be close book, close notes, close homework assignments and no electronic assistance. However, each is allowed and encouraged to bring one piece of paper (regular size) with information (possibly on both sides) useful for midterms.

The midterm will cover the materials covered in the first three weeks. Specifically, it solves linear system with constant coefficients (matrix  $A$ )

$$\mathbf{x}(t)' = A\mathbf{x}(t) + f(t).$$

For such system, we have explicit expression of all possible solutions. So any question on properties of solutions of this system could be answered by either finding explicit solutions, or finding the explicit expression of the general solutions.

There are two technical parts: One is to find  $e^{At}$ , if  $A$  is given numerically, which will give the solutions, either general solutions or with initial conditions. Thus one should be able to find the asymptotic behavior of the solutions, whether it converges to a finite point, to a periodic solution, or diverge to infinite.

The other technical part is to use property of linear algebra to say something of the solution, knowing certain property of the matrix  $A$ . In doing this, you can use all the linear algebra results proved or stated in the class, like  $L + N$  decomposition, Jordan form (one does not need to know Jordan form to solve problems, but if you know, you can use it). We have proved quite a few results on linear algebra. The purpose of this course is on ODE, so I do expect that you will be able to use results on linear algebra, either theoretical or computational, to study ODE.

Finally, for better prepare the midterm, I suggest

- (1). go over the main statement of the textbook and try to reflect on how the proofs were constructed, and what are the role of these materials in the big frame of studying ODE.
- (2). go over the homework assignments I to III, and try to reconstruct your solutions, with hands. Very important, you should be able to do the matrix calculation with your pen and paper. If you have not practiced this when you were completing your assignments, this is the time to do so.

Finally, to the question what types of problems will be in the midterm, I will say the problems will be similar to those in the first three sets of assignments.