The only way to learn the material well (and thus receive a good grade) is by solving many problems, and struggling to solve the more challenging ones. Unfortunately, there is no shortcut.

Please read all the relevant sections in the textbook.

Homework problems will be assigned bi-weekly and will consist of odd number textbook problems, even number textbook problems, and non-textbook problems. Please only submit even numbered textbook problems and all non-textbook problems for grading. Please hand the problems to me before the class begins. You may discuss these problems with other students, but you must independently write up and submit your own solutions. Copying any part of a solution from a book, solutions guide, or website is cheating! Students are expected to abide by the Georgia Tech Academic Honor Code.

Late homeworks will not be excepted, but you may drop your two lowest homework grades. Emailed homeworks will only be accepted with prior agreement of the Instructor - else they will not be accepted.

To receive credit for a solution, you must clearly indicate how you obtained your solution. You will receive no credit without an explanation. Please keep your written answers brief; be clear and to the point. The grader will deduct points for rambling and for incorrect or irrelevant statements. Please do not show arithmetic and most algebra calculations. Your solutions should look like the solutions of examples in the text. If you are asked to show or prove a general result, you will receive no points for numerically verifying the result or proving it for $2 \times 2$ matrices. However, counterexamples can certainly be $2 \times 2$ matrices.

In order to grade as many problems as possible, your submitted problem sets should be printed very neatly in large “font” and stapled. Please do not cross out. Write on only one side of each page, in a single column, and do not use paper that has been torn out of spiral bound notebooks. You may typeset your solutions, but this is not required.

Please either print or submit a screen shot of your code and solution of computer problems.

There is a second page of problems

1. Read and study the examples in Section

2. Use the method of Separation of Variables to find all solutions of the following ODEs. Remember the absolute value when integrating $\log(x)$ and the constant of integration. You can easily check your answers with one line commands using Wolfram, Alpha Mathematica, or Matlab. Dots denote derivatives with respect to time. Unless otherwise stated, $y = y(x)$ and $y' = dy/dx$.

(a) $2yy' = x^2 + 1$ and $2yy' = x^2 + 1, y(0) = 1$.
(b) $y' = -6xy$ and $y' = -6xy, y(0) = 7$.
(c) $x + \sec(x) \sin(y)y' = 0$
(d) $\dot{N} = rN^2$, where $r > 0$ is a constant, $N(0)=1$. Why do you think that this model is called the “Doomsday Population Model”?
(e) $m\dot{v} = mg - kv$, $v(0) = 0$, where $m > 0, g > 0, k > 0$ are constants. Find $\lim_{t \to \infty} v(t)$.
(f) $m\dot{v} = mg - kv^2, v(0) = 0$ where $m > 0, g > 0, k > 0$ are constants. Find $\lim_{t \to \infty} v(t)$.
(g) $y' = \sin(y)$

3. Joe just boiled (100C) a big pot of soup. By immersing the pot in a big sink full of cold water (kept running at the same temperature 5C) he can bring down the temperature of the soup down to 60C in ten minutes.

(a) How long will be pot need to be cooled in the sink until the temperature reachers 20C?
(b) What will happen after a very long time?
(c) What will the temperature of the soup be after 1 hour?

4. Strogatz 2.2: 1, 3, 4, 5, 7