Disclaimer: “This summary sheet is only intended to give you some guidance, and thus should not be taken as an exhaustive listing of possible test question topics.”

The test will cover §§6.1 and 7.1-7.3.

It will be possible to complete the test without a calculator, but I will allow basic dedicated scientific calculators if you would like to bring one. No graphing calculators will be allowed. Calculators may not be shared without my prior approval. I will have a scientific calculator available during the test which you may come up and use for quick calculations. No notes or any other aids will be allowed on this test.

Laplace Transform Table:

For the test you will be provided with entries 1-11 and 50-53 in the Table of Laplace Transforms found at the end of your book. You still need to be able to use the definition of the Laplace transform and the translation theorems we have talked about.

§6.1

Given a second order DE you should be able to find a lower bound for the radius of convergence of a power series solution about any given ordinary point without actually solving the DE, and the smallest interval on which the power series is guaranteed to converge. Given a second order linear homogeneous DE or IVP with constant or polynomial coefficients, you should be able to the power series solution centered about the ordinary point 0. You will be told how many terms in the power series you need to find. Due to the length of the test, I will not require you to find the pattern (although I might make that an extra credit problem).

§7.1

You need to know the definition of a Laplace transform and be able to use it to find the Laplace transform of a given function. Remember: if you need l'Hospital’s Rule when evaluating the limit, then you must show all the steps and use proper limit notation for that part. You should be able to find the transform of a piecewise continuous function. You should know that the Laplace transform is a linear transform and use that fact when computing Laplace transforms.
§7.2

You need to be able to find the inverse Laplace transform of a given function; remember that this may involve algebraic manipulations or partial fraction decomposition. You should know that the inverse Laplace transform is a linear transform and use that fact when computing Laplace transforms. You need to know the formula for the Laplace transform of the first or second derivative of a function. You should be able to solve a first or second order linear constant coefficient nonhomogeneous IVP using the Laplace transform.

§7.3

You should be able to use the First Translation Theorem and its inverse form to determine a Laplace transform of $e^{at}f(t)$ or an inverse Laplace transform of a function that has been shifted to the right or left ($F(s-a)$). Be aware that you may have to do some algebraic manipulations (such as completing the square or adding and subtracting constants) in order to use the inverse form of the theorem because all of the variables $s$ in your function must be shifted the same amount in order for the theorem to apply. You should know how the unit step function is defined and be able to write a piecewise defined function in function notation using the unit step function. You should be able to use the Second Translation Theorem, its inverse form, and its alternative form to find Laplace or inverse Laplace transforms. All of these techniques/theorems could arise in the course of solving an IVP.