Be Able To:

- ❖ Solve a Differential Equation using Method of Integrating Factors
- ❖ Solve a Differential Equation using Separation of Variables
- ❖ Classify a Differential Equation: linear or nonlinear, its order, if it is autonomous or nonautonomous, homogeneous or nonhomogenous, etc.
- ❖ Be able to interpret the Wronskian of two functions
- ❖ Solve a Differential Equation using Method of Undetermined Coefficients and make the correct “guess”
- ❖ Given a nonlinear system, linearise around the critical points and then classify them
- ❖ Use the Laplace Transform Table to transform and invert transforms
- ❖ Laplace Transform special functions like heaviside and the delta function
- ❖ Laplace Transform a differential equation with initial conditions and then solve it by inverting
- ❖ Use partial fractions to invert a transform
- ❖ Locate Singular Points
- ❖ Solve the indicial equation to choose the forms of solutions to variable coefficient differential equations via Frobenius Method
- ❖ Solve up to a specified order using Frobenius Method
- ❖ Using a given variable transform, change a differential equation such that it is either a Bessel Equation or a Legendre Equation
- ❖ Find the Fourier Series representation of a function
- ❖ Perform a simple Fourier Transform using the integral definition (similar to your homework)
- ❖ Know where Bessel Equation and Legendre Equations are applicable
- ❖ Know about the qualitative behaviors of solutions to the heat equation (as discussed in class)
- ❖ Know about the qualitative properties of the gaussian under the fourier transform (as discussed by Zack during his guest lectures)

About the Test:

- It will be on gradescope
- Covers all sections (so material from midterm 1 and 2 as well)
- You will have the full 3 hours
- You may use your textbook, notes, a calculator, the class website, and your homework for this test. No internet/website resources allowed besides the class website
- You will need to have your webcam on for proctoring
- Illegible answers will not receive credit.

- Answers without work and justification will not receive credit
- Only work written on the exam sheet will be graded. If you use a scratch sheet, make sure your complete answer is copied onto the exam sheet.
- On problems with multiple parts, clearly separate your work and mark each part
- Remember that you are showing me what you know! Focus on showing your thought process and be explicit in your methods.
- You will need to copy the honor code on the first page of your test and sign it