

### Chapter 1

1. Determine the order of a given D.E.
2. Determine whether a given D.E. is linear or not
3. Determine whether a given D.E. is homogeneous or non-homogeneous
4. Identify the type of first order D.E. a given equation is [Separable, Linear, Exact, Homogeneous, etc.]
5. Solve a given first order D.E. based on the type it is determined to be.

### Chapter 2

6. Identify second order D.E.
7. Find the Characteristic equation associated with a given D.E.
8. Find the roots of the characteristic equation.
9. Find the Complementary solution to a given D.E.; this includes with or without initial conditions
10. Find the Wronskian of a given D.E.; determine whether the associated solutions from the complementary solution are linearly independent or not.
11. Use the method of Undetermined Coefficients or Variation of Parameters to find the complementary solution of a given D.E.
12. Find the Particular solution associated with a non-homogeneous D.E.; this includes with or without initial conditions.
13. Give the general solution of a given D.E.; with or without initial conditions.
14. Determine if a given value is an eigenvalue for a given D.E.
15. Find the eigenvalues and associated eigenfunctions for a given D.E.

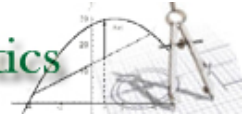
### Chapter 3

16. Find the Power Series representation for the solution of a given D.E.
17. Express the general solution of a Power Series in the form of familiar elementary functions
18. Determine the Radius of Convergence for a Power Series solution
19. Determine if, for a given D.E.,  $x = a$  is an ordinary or singular point.
20. Determine if a singular point is regular or irregular.
21. Find the roots of the indicial equation.
22. Solve applications associated with the above listed types of D.E.

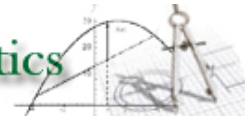


PENSACOLA  
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Department of Mathematics



MAP2302 Differential Equations  
Final Exam Topic Outline



## Chapter 4

23. Find the LaPlace Transform and Inverse LaPlace Transform of a given function
24. Transform initial value problems
25. Find the LaPlace Transform/Inverse LaPlace Transform of translated functions
26. Find the LaPlace Transform/Inverse LaPlace Transform requiring the use of Partial Fraction Decomposition
27. Find the LaPlace Transform/Inverse LaPlace Transform using the Convolution Property
28. Find the LaPlace Transform/Inverse LaPlace Transform using Differentiation or Integration
29. Find the LaPlace Transform/Inverse LaPlace Transform of periodic or piecewise functions

## Chapter 5

30. Transform a differential equation into a system of first order equations
31. Solve a linear system of differential equations by elimination
32. Solve a system using a Polynomial Differential Operator
33. Find the Operational Determinant of a given system
34. Determine if a system is degenerate; if so does it have no solution or infinitely many solutions
35. Determine the natural frequencies of a given system
36. Verify a given vector function is a solution of a matrix differential equation
37. Use the Wronskian to determine whether given solutions are linearly independent
38. Use the Eigenvalue method for solving  $\mathbf{x}' = \mathbf{Ax}$
39. Find the characteristic equation, eigenvalues, and associated eigenvectors for a given matrix differential equation  $\mathbf{x}' = \mathbf{Ax}$  (this may include complex values)
40. Solve a given system by the Eigenvalue Method for Homogeneous Systems
41. Solve applications by the above methods as appropriate

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