

MAT258: University of Maine: Fall 2008

Instructor: Jerry Farlow

Text: Differential Equations & Linear Algebra by Farlow, Hall, McDill and West (2nd edition)

Testing Policy: Over the course of the semester we will have 4 exams, each counting 100 points. There will be no make-up tests, but the lowest grade will be thrown out with the exception of the last exam. I will not collect homework but the exams will always include at least one problem, sometimes more, from the homework.

Office Hours: You can get help at any time in the MathLab, which is now located in room 410 Neville. I will let you know of my office hours after the class begins. If you cannot make my scheduled office hours, you can always make an appoint to meet with me. Class info it also posted on my webpage at <http://germain.umemat.maine.edu/faculty/farlow/index.htm>

Online Tools: You can draw direction fields and phase plane plots online by going to www.prenhall.com/farlow , then click on Syllabus Manager/ODE Solver and enter either DFIELD 2002 or PPLANE2002. A window opens and you can enter your differential equation etc. The only difference from the text is that the dependent variable is x instead of y. This program was written by John Polking of Rice University.

Chapter 1 First-Order Differential Equations

- Sec 1.1 Dynamical Systems: Modeling 4, 7, 11
- Sec 1.2 Solutions and Direction Fields: 2, 7, 16-21
- Sec 1.3 Separation of Variables 1-5, 11, 27, 57
- Sec 1.4 Approximation Methods 1, 17, 29,
- Sec 1.5 Picard's Theorem (Existence and Uniqueness of Solutions) 1, 9, 24, 26

Chapter 2 Linearity and Nonlinearity

- Sec 2.1 Linear Equations: Nature of Their Solutions 1-10, 18, 24, 26, 35
- Sec 2.2 Solving the First-Order Linear DE 2, 8, 16, 23, 32
- Sec 2.3 Growth and Decay Problems 1, 2, 24, 28, 31
- Sec 2.4 Linear Models: Mixing and Cooling
- Sec 2.5 Nonlinear Models: Logistic Equation 1, 6, 19, 35
- Sec 2.6 Systems of Differential Equations: A First Look 1, 21

Review, Test 1, Go Over Test

Chapter 3 Linear Algebra

- Sec 3.1 Matrices: Sums and Products 2, 9, 25, 47, 61, 62
- Sec 3.2 Systems of Linear Equations 1, 11-19, 20, 26, 54, 76
- Sec 3.3 The Inverse of a Matrix 1, 7, 15, 26
- Sec 3.4 Determinant and Cramer's Rule 1, 15, 30, 45
- Sec 3.5 Vector Spaces and Subspaces 1-9, 11-16, 37, 38, 50, 53, 66, 71
- Sec 3.6 Basis and Dimension 1, 6, 7, 15, 19, 26, 55, 66

Chapter 4 Higher-Order Differential Equations

- Sec 4.1 The Harmonic Oscillator 1, 3, 24, 57, 68
- Sec 4.2 Real Characteristic Roots 4, 5, 27, 29, 59
- Sec 4.3 Complex Characteristic Roots 2, 19, 45-46, 74

Review, Test 2, Go Over Test

- Sec 4.4 Undetermined Coefficients 1, 7, 13, 18, 61
- Sec 4.5 Variation of Parameters 1, 9, 22
- Sec 4.6 Forced Oscillation 1, 16-17, 27-30, 31
- Sec 4.7 Conservation and Conversion 1, 2, 6, 14, 25, 45

Chapter 5 Linear Transformations

- Sec 5.1 Linear Transformations 1, 2, 10, 17, 20-21, 36, 75
- Sec 5.2 Properties of Linear Transformations 1, 5, 7, 27, 72
- Sec 5.3 Eigenvalues and Eigenvectors 2, 19, 72, 76

Chapter 6 Linear Systems of Differential Equations

- Sec 6.1 (skip) I'll give you a summary of this material
- Sec 6.2 Linear Systems with Real Eigenvalues 1, 9, 51, 56
- Sec 6.3 Linear Systems with Non Real Eigenvalues 1, 13, 32, 39
- Sec 6.4 Stability and Linear Classification 1, 2, 5

Review, Test 3, Go Over Test

Chapter 7 Nonlinear Systems of Differential Equations

- Sec 7.1 Nonlinear Systems 1, 20, 31, 35
- Sec 7.2 Linearization 1, 6, 14, 15

Chapter 8 Laplace Transforms

- Sec 8.1 The Laplace Transform and Its Inverse 4, 25, 27, 41, 49
- Sec 8.2 Solving DEs and IVPs with the Laplace Transform 4, 5, 10
- Sec 8.3 The Step Function and Delta Function 1, 8, 47, 51
- Sec 8.4 The Convolution Integral and the Transfer Function 1, 14, 20, 25, 32, 40

Chapter 10 Control Theory

- Sec 10.1 Feedback Controls 1, 9, 14, 18, 19
- Sec 10.2 Introduction to Optimal Control 1, 7, 13, 16

Review, Test 4, Go Over Test