

King Fahd University of Petroleum & Minerals
Department of Mathematics and Statistics
Term 151

(Prof. Abdelkader Boucherif)

Course #: MATH 565
Title: Differential Equations I
Textbook: Nonlinear Differential Equations and Dynamical Systems
 by F. Verhulst

Week #	MATERIAL	Homework
1	1.1 Definitions and Notation 1.2 Existence and uniqueness 1.3 Gronwall's inequality.	
2	2.1 Phase space Orbits 2.2 Critical points and linearization 2.3 Periodic solutions	2.1 + 2.2 + 2.3 + 2.5
3	2.4 First integral - Integral manifolds	2.8
4	3.1 Two-dimensional linear systems 3.2 Remarks on 3-dimensional systems 3.3 Critical points of nonlinear systems	3.1 + 3.3 + 3.5 + 3.7
5	4.1 Bendixon's criterion 4.2 Geometric auxiliaries	
6	4.3 The Poincare-Bendixon Theorem 4.4 Application of the Poincare- Bendixon Theorem	4.2 + 4.4 + 4.5 + 4.6
7	4.5 Periodic solutions in \mathbb{R}^n 5.1 Simple examples 5.2 Stability of equilibrium solutions	
8	5.3 Stability of periodic solutions 5.4 Linearization	5.1 + 5.4
9	6.1 Equations with constants coefficients 6.2 Equations with coefficients which have limits 6.3 Equations with periodic coefficients	6.3 + 6.5
10	7.1 Asymptotic stability of the trivial solution 7.2 Instability of the trivial solution 7.3 Stability of periodic solutions of autonomous systems	7.2 + 7.3
11	8.1 Introduction 8.2 Lyapunov Functions 8.3 Hamilton systems	
12	8.3 (Cont.) Systems with integrals 8.4 Applications and examples	
13	9.1 Background and examples 9.2 Basic material 9.3 Naïve expansion	
14	The Poincare expansion theorem	
15	Review and/or Presentations	