## Bronx Community College of the City University of New York Department of Mathematics and Computer Science

<ul> <li>Syllabus: MTH 34 Differential Equations (4 credits-4 hours)</li> <li>Prerequisite: MTH 33 - Calculus III</li> <li>Text: Differential Equations, 4<sup>th</sup> Ed. P. Blanchard, R. L. Devaney, G. R. Hall Cengage Learning 2011, ISBN: 978-1133109037</li> </ul>		
Section	Торіс	Suggested Exercises
1. 1.1 1.2 1.3 1.4 1.5 1.6 1.8	<b>First-Order Differential Equations</b> Modeling via Differential Equations Analytic Technique: Separation of Variables Qualitative Technique: Slope Fields Numerical Technique: Euler's method Existence and Uniqueness of Solutions Equilibria and the Phase Line Linear Equations	<ul> <li>p.14: 1, 2, 3, 5, 7, 11, 13–15, 17, 19, 21–23</li> <li>p.33: 1–19 odd, 4, 10, 20, 27–30, 36, 39, 41, 42</li> <li>p.47: 1, 3, 6, 7, 9, 11–14, 16–18, 22</li> <li>p.61: 1, 2, 5, 6, 7, 11, 14, 16</li> <li>p.71: 1, 3, 5–7, 11, 12, 14, 16</li> <li>p.89: 1, 3, 4, 5, 7, 13, 15, 17, 18, 23, 25, 29, 37, 43, 44</li> <li>p.121: 1, 3, 5, 7, 11, 13, 17, 18, 21, 23, 29</li> </ul>
1.9	Integrating Factors for Linear Equations Review Exercises for Chapter 1	p.133: 1, 3, 5, 9, 11, 20, 21, 23, 24 p.136: 1–9, 11–20, 21-43 odd, 44, 46–48, 51–55
$2. \\ 2.1 \\ 2.2 \\ 2.3^{1} \\ 2.4 \\ 2.5 \\ 2.6$	<b>First-Order Systems</b> Modeling via Systems The Geometry of Systems The Damped Harmonic Oscillator Additional Analytic Methods for Special Systems Euler's Method for Systems Existence and Uniqueness for Systems Review Exercises for Chapter 2	<ul> <li>p.161: 1-8,11-15,19-24</li> <li>p.178: 1-5,7,9,11,12,13,15, 18,19, 21, 23-27</li> <li>p.187: 1,5, 9, 10</li> <li>p.194: 1-7 odd, 10, 13</li> <li>p.202: 1, 4, 5, 7</li> <li>p.208: 3, 8, 9, 11</li> <li>p.224: 1-28, 29-33 odd, 37</li> </ul>
<b>3.</b> 3.1 3.2 3.3 3.4 3.5 3.6 3.7	Linear Systems Properties of Linear Systems Straight-Line Solutions Phase Planes (Real Eigenvalues) Complex Eigenvalues Repeated and Zero Eigenvalues Second-order Linear Equations The Trace-Determinant Plane Review Exercises for Chapter 3	p.258: 4, 5–11 odd, 14–17, 19, 24, 25, 27, 28, $31-35^2$ p.277: 1–7 odd, 11, 13, 15–19, 21, 23 p.293: 1–11 odd, 15, 19, 21, 27 p.310: 1-15 odd, 17, 19, 23-26 p.327: 1-7 odd, 11–15 odd, 16, 18, 21–23 p.342: 1–15 odd, 21, 23,26, 29, 34, 40 p.358: 1, 2, 3, 5, 9, 11, 12 p.376: 1–18, 19–32 odd
4. 4.1 4.2 4.3 App. B	Forcing and Resonance Forced Harmonic Oscillators Sinusoidal Forcing Undamped Forcing and Resonance Power Series Method Review Exercises for Chapter 4	<ul> <li>p.399: 1, 5, 7, 11, 15, 18–20, 25, 27, 31, 34–37, 40</li> <li>p.412: 1, 5, 9, 11, 13, 15–19, 23</li> <li>p.424: 1, 5, 6, 7, 10, 13–17 odd, 21</li> <li>p.748: 1–17 odd</li> <li>p.449: 1–14, 15–27 odd</li> </ul>
<b>5.</b> 5.1 5.2	<b>Nonlinear Systems</b> Equilibrium Point Analysis Qualitative Analysis	p.472: 1, 3, 5–7, 11, 17 p.487: 1–11 odd
<b>6.</b> 6.1 6.2 6.3 6.4	Laplace Transforms Laplace Transforms <sup>3</sup> Discontinuous Functions Second-Order Equations Delta Functions and Impulse Forcing Review Exercises for Chapter 6	p.577: 1–3, 5–9, 12, 13, 15, 20, 24, 27 p.585: 1, 2, 3–9 odd, 13, 17, 19 p.599: 1, 3, 5, 15, 17, 19–21, 27, 29, 31, 33, 34 p.608: 1–9 p.627: 1–17, 19-30 odd

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 $^{1}$ This section may be deferred until the topic harmonic oscillator is considered in more detail in chapter 4.

 $^{2}$ Problem 35 is worth emphasizing; the Wronskian is introduced and Abel's Theorem can be discussed here.

<sup>&</sup>lt;sup>3</sup>Fourier Transforms can be briefly mentioned. We focus on Laplace Transforms.