

# MA372: Differential Equations

Baker University — Fall 2023

Each of the following comes from the textbook *Elementary Differential Equations and Boundary Value Problems* (Ninth Edition) by William E. Boyce and Richard C. DiPrima.

## Exam 1: First Order Differential Equations

date	day	section	topic(s)
8/23	W	§1.1: Mathematical Models; Direction Fields	<ul style="list-style-type: none"><li>◦ direction fields</li><li>◦ equilibrium solutions</li><li>◦ basic examples</li></ul>
8/25	F	§1.2: Solutions of Some Differential Equations	<ul style="list-style-type: none"><li>◦ basic examples</li><li>◦ initial value problems</li><li>◦ integral curves</li></ul>

date	day	section	topic(s)
8/28	M	§1.3: Classification of Differential Equations	<ul style="list-style-type: none"><li>◦ ODEs versus PDEs</li><li>◦ order</li><li>◦ linearity</li><li>◦ basic examples</li></ul>
8/30	W	§2.1: Linear Equations; Integrating Factors	<ul style="list-style-type: none"><li>◦ first order linear equations</li><li>◦ integrating factors</li><li>◦ initial value problems</li></ul>
9/1	F	§2.2: Separable Equations	<ul style="list-style-type: none"><li>◦ Chain Rule for Derivatives</li><li>◦ initial value problems</li><li>◦ integral curves</li></ul>

date	day	section	topic(s)
9/4	M	<i>Labor Day</i>	
9/6	W	§2.6: Exact Equations	<ul style="list-style-type: none"><li>◦ potential functions</li><li>◦ solutions of exact equations</li><li>◦ integrating factors</li></ul>
9/8	F	§2.4: Linear vs. Non-Linear Equations §2.8: Existence and Uniqueness Theorem	<ul style="list-style-type: none"><li>◦ existence and uniqueness</li><li>◦ Picard's Method</li><li>◦ basic examples</li></ul>

date	day	section	topic(s)
9/11	M	Exam I Review	
9/13	W	Exam I Review	
9/15	F	Exam I	

## Exam 2: Second Order Linear Equations

date	day	section	topic(s)
9/18	M	§3.1: Homogeneous Equations	<ul style="list-style-type: none"> <li>◦ homogeneity</li> <li>◦ linearity</li> <li>◦ characteristic equation</li> <li>◦ initial value problems</li> </ul>
9/20	W	§3.2: Linear Homogeneous Equations	<ul style="list-style-type: none"> <li>◦ existence and uniqueness</li> <li>◦ superposition</li> <li>◦ computing the Wronskian</li> </ul>
9/22	F	§3.2: Linear Homogeneous Equations	<ul style="list-style-type: none"> <li>◦ fundamental set of solutions</li> <li>◦ Abel's Theorem</li> <li>◦ basic examples</li> </ul>

date	day	section	topic(s)
9/25	M	§3.3: Complex Roots of Characteristic Eq'n	<ul style="list-style-type: none"> <li>◦ discriminant</li> <li>◦ Euler's Formula</li> <li>◦ initial value problems</li> </ul>
9/27	W	§3.4: Repeated Roots; Reduction of Order	<ul style="list-style-type: none"> <li>◦ D'Alembert's Method</li> <li>◦ reduction of order</li> </ul>
9/29	F	§3.5: Method of Undetermined Coefficients	<ul style="list-style-type: none"> <li>◦ the fundamental theorem</li> <li>◦ basic examples</li> </ul>

date	day	section	topic(s)
10/2	M	§3.6: Variation of Parameters	<ul style="list-style-type: none"> <li>◦ motivation</li> <li>◦ basic examples</li> </ul>
10/4	W	§3.6: Variation of Parameters	<ul style="list-style-type: none"> <li>◦ the fundamental theorem</li> <li>◦ further examples</li> </ul>
10/6	F	§5.1: Review of Power Series	<ul style="list-style-type: none"> <li>◦ radius of convergence</li> <li>◦ interval of convergence</li> <li>◦ common examples of power series</li> <li>◦ change of index</li> </ul>

date	day	section	topic(s)
10/9	M	§5.2: Series Solutions, Part I	<ul style="list-style-type: none"> <li>◦ ordinary point</li> <li>◦ singular point</li> <li>◦ recurrence relations</li> </ul>
10/11	W	§5.3: Series Solutions, Part II	<ul style="list-style-type: none"> <li>◦ analytic functions</li> <li>◦ the fundamental theorem</li> <li>◦ further examples</li> </ul>
10/13	F	<i>Fall Break</i>	

date	day	section	topic(s)
10/16	M	§5.4: Euler Equations	<ul style="list-style-type: none"> <li>◦ real distinct roots</li> <li>◦ real repeated roots</li> <li>◦ complex roots</li> </ul>
10/18	W	Exam II Review	
10/20	F	Exam II Review	

date	day	section	topic(s)
10/23	M	Exam II	

### Exam 3: Other Methods of Solving Ordinary Differential Equations

date	day	section	topic(s)
10/25	W	§6.1: Definition of the Laplace Transform	<ul style="list-style-type: none"> <li>◦ improper integration</li> <li>◦ Comparison Theorem</li> <li>◦ integral transforms</li> <li>◦ basic examples</li> </ul>
10/27	F	§6.1: Definition of the Laplace Transform	<ul style="list-style-type: none"> <li>◦ inverse Laplace transforms</li> <li>◦ further examples</li> </ul>

date	day	section	topic(s)
10/30	M	§6.2: Solutions of Initial Value Problems	<ul style="list-style-type: none"> <li>◦ further examples</li> <li>◦ initial value problems</li> </ul>
11/1	W	§6.3: Step Functions	<ul style="list-style-type: none"> <li>◦ Heaviside function</li> <li>◦ computing step functions</li> <li>◦ inverse Laplace transforms</li> </ul>
11/3	F	§6.5: Impulse Functions	<ul style="list-style-type: none"> <li>◦ Dirac delta function</li> <li>◦ basic examples</li> </ul>

date	day	section	topic(s)
11/6	M	§6.6: The Convolution Integral	<ul style="list-style-type: none"> <li>◦ properties</li> <li>◦ inverse Laplace transforms</li> <li>◦ initial value problems</li> </ul>
11/8	W	§8.1: The Euler or Tangent Line Method	<ul style="list-style-type: none"> <li>◦ Euler Method</li> <li>◦ Backward Euler Formula</li> <li>◦ basic examples</li> </ul>
11/10	F	§8.1: The Euler or Tangent Line Method	<ul style="list-style-type: none"> <li>◦ basic examples</li> <li>◦ order of convergence</li> <li>◦ global truncation error</li> <li>◦ local truncation error</li> <li>◦ round-off error</li> </ul>

date	day	section	topic(s)
11/13	M	§8.2: The Runge-Kutta Method	<ul style="list-style-type: none"> <li>◦ basic examples</li> <li>◦ order of convergence</li> <li>◦ local truncation error</li> </ul>
11/15	W	Exam III Review	
11/17	F	Exam III Review	

date	day	section	topic(s)
11/20	M	Exam III	
11/22	W	<i>Thanksgiving Break</i>	
11/24	F	<i>Thanksgiving Break</i>	

## Final Exam Review

date	day	section	topic(s)
11/27	M	Final Exam Review	
11/29	W	Final Exam Review	
12/1	F	Final Exam Review	

date	day	section	topic(s)
12/4	M	Final Exam Review	
12/6	W	Final Exam Review	
12/8	F	Final Exam Review	

**Final Exam:** Tuesday, December 12 from 1:00 to 4:00 PM in Mulvane 202