**BRONX COMMUNITY COLLEGE**
**of the City University of New York**
**DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE**

**SYLLABUS: MTH 31 - Analytic Geometry and Calculus I (4 credits/6 hours per week)**

**PREREQUISITE: MTH 30 or equivalent; and CUNY English Proficiency, or ENG 100 or 110, if required**

**TEXT**: Calculus: Early Transcendentals (Ninth Edition) by Stewart et al., Cengage Learning. ISBN 978-1337613927
Students who do not need Math 33 may use Single Variable Calculus: Early Transcendentals (Ninth Edition) by Stewart et al., Cengage Learning. ISBN 978-0357022269

This course is a **Pathways Core B (Mathematical and Quantitative Reasoning) Course**:
A course in this area must meet all of the following learning outcomes. A student will:

a) Interpret and draw appropriate inferences from quantitative representations, such as formulas, graphs, or tables.
b) Use algebraic, numerical, graphical, or statistical methods to draw accurate conclusions and solve mathematical problems.
c) Represent quantitative problems expressed in natural language in a suitable mathematical format.
d) Effectively communicate quantitative analysis or solutions to mathematical problems in written or oral form.
e) Evaluate solutions to problems for reasonableness using a variety of means, including informed estimation.
f) Apply mathematical methods to problems in other fields of study.

**Course Learning Outcomes** **(Pathways Learning Outcomes contributed to)**
On successful completion of this course a student will be able to:

1. Evaluate limits at a value and at infinity by using limit laws and the Squeeze Theorem (a, b, c, e)
2. Differentiate algebraic and transcendental functions including by use the limit definition; Product, Quotient, and Chain Rules; and implicit differentiation (a, b)
3. Use differentiation to compute instantaneous rates of change and tangent lines (c, d, e, f)
4. Compute maxima and minima of functions using calculus to solve optimization problems arising in applications and other fields of study (b, c, d, e, f)
5. Model and solve related rates problems (b, c, d, f)
6. Apply methods of calculus to curve sketching (a, b, e)
7. Anti-differentiate algebraic and transcendental functions (a, b)
8. Approximate integrals by Riemann sums (b, d, e)
9. Evaluate elementary integrals (b, d, e)
10. Compute definite integrals geometrically or using calculus to determine areas enclosed by curves (a, b, c, d, f)

| SECTION | TOPIC | SUGGESTED EXERCISES |
|---|---|---|
| **Week 1** | | |
| | Chapter 2: Limits and Derivatives | |
| 2.1 | The Tangent and Velocity Problems | 82/ 1, 3,5, 7 |
| 2.2 | The Limit of a Function | 92/ 1-9, 11, 29-39 odd |
| 2.3 | Calculating Limits Using the Limit Laws | 103/ 1-33 odd, 41, 43, 45, 47 |
| **Week 2** | | |
| 2.5 | Continuity | 124/ 1-6, 13, 17, 19, 21, 23, 29, 35, 41, 43, 51, 55, 57 |
| 2.6 | Limits at infinity; Horizontal Asymptotes | 138/ 3, 5, 7, 15-41 odd, 47, 49 |
| **Week 3** | | |
| 2.7 | Derivatives and Rates of Change | 149/ 3, 5, 7, 9, 13, 15, 19, 21, 23, 25, 29 |
| 2.8 | The Derivative as a Function | 162/ 1, 3, 21-31 odd, 41, 43 |
| | Review | 168/ 1-19 odd, 29-39 odd, 45, 49 |
| **Week 4** | | |
| | Exam | |
| | Chapter 3: Differentiation Rules | |
| 3.1 | Derivatives of polynomials and Exponential functions | 182/ 3-41 odd, 53, 59, 61 |
| 3.2 | The Product and Quotient rule | 190/ 1-37 odd, 43, 44, 49 |
| **Week 5** | | |
| 3.3 | Derivatives of Trigonometric Functions | 198/ 1-29 odd, 35, 39 |
| 3.4 | The Chain Rule | 206/ 1-59 odd, 65 |
| 3.5 | Implicit Differentiation | 215/ 1-21 odd, 27-41 odd, 47 |
| **Week 6** | | |
| 3.6 | Derivatives of Logarithmic and Inverse Trigonometric Functions | 225/ 63-31 odd, 43-55 odd, 61-71 odd |
| 3.7 | Rates of Change in the Natural and Social Sciences | 235/ 1-4, 7, 9, 11, 33 |
| **Week 7** | | |
| 3.9 | Related Rates | 252/ 1-4, 7, 9, 11, 17, 21 |
| 3.10 | Linear Approximations and Differentials | 259/ 1-9 odd, 19, 45, 47 |
| 3.11 | Hyperbolic Functions | 267/ 1-6, 7-17 odd, 35-47 |
| **Week 8** | | |
| | Review | 270/ 1-53 odd |
| | Exam | |
| | Chapter 4: Applications of Differentiation | |
| 4.1 | Maximum and Minimum Values | 287/ 3-6, 7-13 odd, 29-47, 51-65 odd |
| **Week 9** | | |
| 4.2 | The Mean Value Theorem | 296/ 5-8, 9, 11, 13, 15, 17, 23, 27, 29, 39 |
| 4.3 | What Derivatives Tell Us about the Shape of a Graph | 305/ 1, 2, 5, 6, 8, 9-27 odd, 31, 43, 45-59 odd, 76, 77 |

**Week 10**

| | | |
|---|---|---|
| 4.4 | Indeterminate Forms and l'Hospital's Rule | 317/ 5, 7, 9-69 odd, 77 |
| 4.5 | Summary of Curve Sketching | 328/ 1-53 odd |

**Week 11**

| | | |
|---|---|---|
| 4.7 | Optimization Problems | 343/ 3,5,7,8,15,19,21,25,27,31,47,55,63,79 |
| 4.8 | Newton's Method | 355/ 1-7 odd, 11, 13, 29 |
| 4.9 | Antiderivatives | 362/ 1-4, 5-25 odd, 29, 31, 35, 43, 49, 54, 65-69 odd |

**Week 12**

| | | |
|---|---|---|
| | Review | 365/ 1-17 odd, 19-33, 45, 65-73 odd |
| | Exam | |

Chapter 5: Integrals

| | | |
|---|---|---|
| 5.1 | The Area and Distance Problems | 384/ 1-23 odd |

**Week 13**

| | | |
|---|---|---|
| 5.2 | The Definite Integral | 397/1-13 odd, 19-47 odd, 51-75 odd |
| 5.3 | The Fundamental Theorem of Calculus | 408/ 1-53 odd, 67-73 odd |
| 5.4 | Indefinite Integrals and the Net Change Theorem | 418/ 1-23 odd, 27-53 odd, 69, 71 |

**Week 14**

| | | |
|---|---|---|
| 5.5 | The Substitution Rule | 428/ 1-53 odd, 59-79 odd |
| | Review for the final exam | |

**Academic Integrity**

Academic dishonesty (such as plagiarism and cheating) is prohibited at Bronx Community College and is punishable by penalties, including failing grades, dismissal and expulsion. For additional information and the full policy on Academic Integrity, please consult the BCC College Catalog.

**Accommodations/Disabilities**

Bronx Community College respects and welcomes students of all backgrounds and abilities. In the event you encounter any barrier(s) to full participation in this course due to the impact of a disability, please contact the disAbility Services Office as soon as possible this semester. The disAbility Services specialists will meet with you to discuss the barriers you are experiencing and explain the eligibility process for establishing academic accommodations for this course. You can reach the disAbility Services Office at: disability.services@bcc.cuny.edu, Loew Hall, Room 211, (718) 289-5874.

08/03 C.O'S.
08/07 MM
07/11 MM
09/11 AM
06/12 EA new ed.
01/16 EA new ed.
10/17 EA for Pathways compliance
08/22 RG new ed.
01/23 EA COVID – removed 07/23
03/23 IP