**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 (9th Edition) by Stewart et al., Cengage Learning. ISBN 978-1-337-62418-3**

**Students who do not need MTH 33 may use**

**Single Variable Calculus (9th Edition) by Stewart et al., Cengage Learning. ISBN 978-0-357-04291-5**

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:

1. Interpret and draw appropriate inferences from quantitative representations, such as formulas, graphs, or tables.
2. Use algebraic, numerical, graphical, or statistical methods to draw accurate conclusions and solve mathematical problems.
3. Represent quantitative problems expressed in natural language in a suitable mathematical format.
4. Effectively communicate quantitative analysis or solutions to mathematical problems in written or oral form.
5. Evaluate solutions to problems for reasonableness using a variety of means, including informed estimation.
6. 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 trigonometric 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 trigonometric functions (a, b)
8. Approximate integrals by Riemann sums (b, d, e)
9. Evaluate elementary integrals, including by use of substitution and the Fundamental Theorem of Calculus (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

Chapter 1: Functions and Limits

1.4 The Tangent and Velocity Problems 50/ 1, 3, 5, 7

1.5 The Limit of a Function 60/ 1-5, 12-14, 17, 23-28

1.6 Calculating Limits Using the Limit Laws 70/ 1, 3-23 odd

1.8 Continuity 92/ 3, 7, 9, 15-21 odd, 25, 33, 37, 39, 41, 44, 45,

 47, 49, 53, 55, 57

*Review* *Exercises* 96/ 1-11 odd, 17, 23, 27, 29

Chapter 2: Derivatives

2.1 Derivatives and Rates of Change 116/ 1, 3, 7, 21-31 odd, 39-47 odd, 53, 57, 59

2.2 The Derivative as a Function 128/ 1, 3, 4, 7, 19, 20, 21, 25-33 odd, 39-51 odd

2.3 Differentiation Formulas 143/ 1-43 odd, 51, 53, 69, 77

2.4 Derivatives of Trigonometric Functions 154/ 1-17 odd, 25, 29, 39-49 odd

2.5 The Chain Rule 162/ 1-45 odd, 47, 51, 55, 69, 71

2.6 Implicit Differentiation 169/ 1-19 odd, 25, 27, 31, 35, 43, 45

2.7 Rates of Change in the Natural and 181/ 1-9 odd, 15, 18

 Social Sciences

2.8 Related Rates 189/ 1, 3, 9, 10, 11, 13-33 odd

2.9 Linear Approximations and Differentials 196/ 1, 3, 5, 7-25 odd, 31

*Review Exercises* 200/ 3, 5, 11, 13-37, 45, 51, 59, 61, 75, 77, 79, 82

Chapter 3: Applications of Differentiation

3.1 Maximum and Minimum Values 216/ 3, 5, 15-27 odd, 29-55 odd

3.2 The Mean Value Theorem 225/ 1, 11, 13, 17, 21

3.3 What Derivatives Tell Us about 234/ 1, 5, 7, 8, 9-17 odd, 33-41 odd

 the Shape of a Graph

3.4 Limits at Infinity; Horizontal Asymptotes 247/ 3, 9-29 odd, 37, 41

3.5 Summary of Curve Sketching 256/ 1-35 odd

3.7 Optimization Problems 270/ 3, 5, 7, 11, 17, 21, 27, 31

3.8 Newton’s Method 283/ 5, 7, 13-19 odd, 29

3.9 Antiderivatives 290/ 1-41 odd, 43, 45, 47

*Review Exercises* 293/ 1-27 odd, 38, 41, 46, 49, 55, 57

Chapter 4: Integrals

4.1 The Area and Distance Problems 311/ 1, 3, 5, 13, 15, 21, 25

4.2 The Definite Integral 324/ 3, 5, 9, 17, 21-25 odd, 31, 33, 37

4.3 The Fundamental Theorem of Calculus 335/ 3, 7-35 odd, 45, 51, 53

4.4 Indefinite Integrals and the Net 345/ 1-11 odd, 19-41 odd, 55, 57

Change Theorem

4.5 The Substitution Rule 355/ 1-29 odd, 35-51 odd

*Review Exercises* 358/ 2, 5, 11-29 odd, 35, 37, 39

**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.

Last updated 08/10/2022