Division of Mathematical Sciences

Ma 103

College Algebra

2023-24 First Semester

Instructor Information

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| Section: |  | Ma 103-1 | Ma 103-2 |
| Time/Room: |  | MTWF 1:00-1:50P.M., Al 302 | MTWF 2:00-2:50P.M., Al 303 |
| Instructor: |  | Mr. Charles Lacey | Dr. Dave Brown |
| Email: |  | clacey@bju.edu | ddbrown@bju.edu |
| Office: |  | Al 70 | Al 74 |
| Office Hours: |  | Daily by appointment: <https://calendly.com/clacey-bju> | MTWF 12:15 in Al 301  T 2:50 in AL 303 |

Course Information

### Catalog Description

Review of elementary algebra. Stress on the concept of relation and function, algebraic functions, and their graphs. 3 credits/3 load/4 class-meetings per week

### Prerequisite

ACT score of 20–25, SAT score of 550–630, completion of STEM modules (090), or placement test

### Textbook and Technology Requirements

* Textbook (required): Aufmann and Nation. *Algebra and Trigonometry*. 8th ed., Cengage, 2015. ISBN 978-1-285-44942-5
* Graphing Calculator (required): TI–83/84 is sufficient. (Note: Certain majors and almost all upper-level Ma courses require a TI-NSpire CAS or TI-89.)

Course Context

### Institutional Context

This course supports the following goals of the institutional (IG), the BJU core (BJ), and the Division of Mathematical Science (MS):

* IG 3: To develop in students Christ-like character through disciplined, Spirit-filled living.
* IG 4: To direct students toward a biblical life view that integrates God’s Truth into practical Christian living.
* IG 5: To prepare students to excel intellectually and vocationally by offering diverse academic programs rooted in biblical truth and centered on a liberal arts core.
* BJ 3c: Will equip students to understand the physical world as God’s creation, as stewardship given to man, and as the physical expression of His glory
* BJ 4: Demonstrate critical thinking in analyzing, evaluating, and synthesizing information and ideas.
* BJ 5: Develop solutions to exercises, working independently, and with others, through critical and creative thinking.
* MS 5: Construct a foundation upon which they, after graduation, can continue the development of their God-given abilities and the learning necessary for their work and life.

### Course Goals

This course is designed to

* CG 1: Ensure that students have the mathematical skills needed to be successful in everyday life. (IG 4, 5)
* CG 2: Demonstrate mathematics as a tool to analyze the order and design in the world around us. (BJ 3c)
* CG 3: Develop character traits such as self-discipline, organization, perseverance, and precision. (IG 3)
* CG 4: Develop sound thinking and reasoning skills. (BJ 4, 5)
* CG 5: Mature the student in the theory and application of mathematics. (MS 1)
* CG 6: Provide a foundation for other mathematics, science, or computer courses. (MS 5)

### Course Objectives

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | The students will be able to… | Course Goals | Course Content | Assessment |
| 1. | Perform operations on polynomials | 3, 5, 6 | Unit 1a | HW, Quiz |
| 2. | Factor polynomials | 3, 4, 5, 6 | Unit 1a | HW, Quiz |
| 3. | Perform operations on rational numbers and expressions | 1, 3, 5, 6 | Unit 1a | HW, Quiz |
| 4. | Solve linear equations and absolute value equations | 1, 3, 5, 6 | Unit 1a | HW, Test |
| 5. | Perform operations on the set of complex numbers | 2, 3, 5, 6 | Unit 1b | HW, Quiz |
| 6. | Solve quadratic equations | 3, 5, 6 | Unit 1b | HW, Test |
| 7. | Derive the quadratic formula | 4, 5, 6 | Unit 1b | HW, Quiz |
| 8. | Solve applications using linear and quadratic equations | 1, 2, 4, 6 | Units 1a, 1b | HW, Test |
| 9. | Solve rational and radical equations | 3, 5, 6 | Unit 1b | HW, Test |
| 10. | Solve inequalities | 1, 3, 5, 6 | Unit 1b | HW, Test |
| 11. | Write and solve equations of variations and apply them to real-life settings | 1, 2, 4, 6 | Unit 1b | HW, Portfolio |
| 12. | Use the Cartesian coordinate system and graph the basic family of functions | 5, 6 | Unit 2 | HW, Quiz |
| 13. | Derive the distance formula | 4, 5, 6 | Unit 2 | HW, Quiz |
| 14. | Apply the basic properties of functions to determine the shapes of graphs | 4, 5, 6 | Unit 2 | HW, Quiz |
| 15. | Use linear and quadratic functions to model real-life applications | 2, 4, 6 | Unit 2 | HW, Portfolio |
| 16. | Prove the Remainder Theorem and the Factor Theorem | 3, 4, 5 | Unit 3 | HW, Quiz |
| 17. | Use the Rational Zeros Theorem | 3, 4, 5 | Unit 3 | HW, Test |
| 18. | Use the theorems in Objectives 16 and 17 along with synthetic division and other tools to help factor polynomials | 3, 4, 5 | Unit 3 | HW, Test |
| 19. | Apply the theorems in Objectives 16 and 17 to help identify the asymptotes of rational functions and graph rational functions | 3, 4, 5 | Unit 3 | HW, Test |
| 20. | Describe characteristics of relations, functions, and inverse functions | 1, 3, 6 | Unit 4 | HW, Quiz |
| 21. | Derive inverse functions for one-to-one functions including exponential and logarithmic functions | 3, 4, 5 | Unit 4 | HW, Test |
| 22. | Evaluate exponential and logarithmic expressions | 1, 6 | Unit 4 | HW, Quiz |
| 23. | Use exponential and logarithmic functions to model real-life applications | 2, 4, 6 | Unit 4 | HW, Portfolio |
| 24. | Solve exponential and logarithmic equations | 3, 4, 5, 6 | Unit 4 | HW, Test |
| 25. | Defend or refute different viewpoints on the interconnections among mathematics, reality, philosophy, and world view. | 2, 3, 4 |  | Discussion Posts |

Course Assessment and Grading

### Activities and Assessment

The course grade will be based on performance in the following activities.

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| --- | --- | --- |
| **Category** | **Grade** | **Description** |
| Homework | 3 x 10 pts | * Out-of-class exercises for each textbook section covered are due at the beginning of each chapter test. |
| HW Quizzes | 10 x 10 pts | * Weekly HW Quizzes will be given at the beginning of class every Friday. Quizzes will consist of HW exercises, and a report of problems completed, graded, and corrected that week. (10 pts) |
| Writing | ≈10 pts | * Discussion Boards: Read-post-respond discussions focusing on viewpoints of mathematics (5 pts) |
| Quizzes | ≈200 pts | * Unit Quizzes: In-class, closed-book, quizzes from Chapters P, 1, 2, 3, & 4. (5 quizzes, 20-50 pts) * Theory Quizzes: In-class, closed-book, 15-minute quizzes focusing on theory for Chapters 1, 2, & 3 (3 quizzes, 10-15 pts) * Pop Quizzes: In-class quizzes (≈5 pts) |
| Applied Take-Homes | 3 x 20-30 pts | * Out-of-class individual assignments covering applied skills from chapters 1, 2, & 3. |
| Tests | 3 x 100 pts | * In-class, closed-book, 50-minute tests focusing on higher-skills and applications for chapters 1, 2, & 3. |
| Final Exam | 1 x 150 pts | * In-class, closed-book, multiple-choice, cumulative, 70-minute exam focusing on higher-order skills, theory, and application. |
| Factoring | 1 x 90 pts | * Failure to achieve an 80% or higher on the Factoring Quiz by the 12th week of class will result in a 0 for this assignment. |

### Homework

Because homework is one of the primary means by which students develop good mathematical habits, it is crucial to success in this course.

* Homework must be neat and well organized. Section numbers and page numbers should appear at the beginning of each new section.
* Homework should be worked out in detail. Answers alone are not acceptable and will receive no credit.
* Exercises should be worked going down the page, never across.
* The student is responsible for checking the answers to all homework before turning in the assignment. Answers to odd-numbered exercises are in the back of the book. Answers to assigned even-numbered exercises are available on Canvas.
* Homework questions will be addressed at the discretion of the teacher, so be prepared to ask questions each class day. Homework will be collected as indicated in the assignment schedule. One of the keys to success in this course is to stay on schedule and to always be prepared.

**Friday Homework Quizzes**

Homework will be evaluated most Fridays in the form of an in-class quiz during the first 10 minutes of class. The quiz will consist of 3 homework exercises as well as the numerical report of exercises personally completed, graded, and corrected if incorrect.

### Discussion Boards (DB)

Discussion Board activities will be assigned in Canvas. These assignments will engage students in topics such as their personal math biography, a biblical worldview of mathematics, the history of math, and self-analysis of math skills. The goal of these assignments is to help students develop and articulate their view of how math fits into God’s world in general and their lives specifically.

### Late or Missing Assignments

* Students are expected to turn in assignments on time. Missing work will be given a grade of 0.
* Friday Homework Quizzes will not be accepted late or made-up.
* Missed chapter test and quizzes may be made up with the instructor’s approval in extreme circumstances.

### Grading Scheme

Final grades will be assigned according to a standard 10 percentage point scale calculated out of the total points available during the semester (≈950 pts). Percentages will be rounded to the nearest whole percentage when determining final grades.

### Presentation Standards

The goal is to develop a professional level of understanding of the course material. Students are expected to submit work that is professional, fluent, and clearly communicated.

* Tests/Quizzes/Assignments are not about what you know, but about what you can communicate about what you know – so the presentation of your work/logic should always be neat, orderly, clearly defined.
* Answers are to be presented as the logical conclusion of your work.
* Papers should not be submitted with “spiral”/ripped edges (clean edges are professional).
* Take-home tests (when time is not limited) should be neatly presented (rewritten, organized neatly, no scratchwork, just a final polished presentation)
* Solutions that are not professionally presented will be penalized 10 percent.

### Classroom Decorum

The classroom is a professional environment. Students are expected to be respectful to their instructor and peers in behavior, attitude, attire, and use of technology. The instructor has the right to require students who are participating in distracting behavior to leave the class.

### Attendance

* Students should notify the instructor by email as soon as possible after an absence (preferably within 24 hours).
* If the absence is planned, the student should notify the instructor before missing class.
* Absent students are personally responsible to obtain notes from classmates.
* BJU attendance policy is in effect (see https://home.bju.edu/bju-policies/ for details).

### Academic Honesty and Integrity Policy

BJU's **academic honesty and integrity** policy is in effect (see https://home.bju.edu/bju-policies/ for details).

### Copyright Policy

© 2023 (Brown and Lacey) as to this syllabus and all lectures. Students are prohibited from selling (or being paid for taking) notes during the course to (or by) any person or commercial firm without the express written permission of the professor teaching the course.

**Tentative Course Schedule**

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| --- | --- | --- | --- |
| **Date** | **Day** | **Class** | **Items Due** |
| 23-Aug | W | P.1, P.2 |  |
| 25-Aug | F | P.3, P.4 | HW Quiz |
| 28-Aug | M | P.4, P.5 |  |
| 29-Aug | T | Review, Chp P Quiz |  |
| 30-Aug | W | 1.1 |  |
| 1-Sep | F | 1.1, 1.2 | HW Quiz |
| 4-Sep | M | Labor Day |  |
| 5-Sep | T | 1.2 | DB 1 |
| 6-Sep | W | P.6, 1.3 |  |
| 8-Sep | F | 1.3 | HW Quiz |
| 11-Sep | M | 1.4 |  |
| 12-Sep | T | 1.4 |  |
| 13-Sep | W | Review, Chp 1 Quiz |  |
| 15-Sep | F | 1.5 | HW Quiz |
| 18-Sep | M | 1.6 |  |
| 19-Sep | T | Catch-Up |  |
| 20-Sep | W | Review, Chp 1 Theory Quiz |  |
| 22-Sep | F | Chp 1 Test | HW Due |
| 25-Sep | M | 2.1 |  |
| 26-Sep | T | 2.2 | Chp 1 Applied Take-Home Due |
| 27-Sep | W | 2.2, 2.3 |  |
| 29-Sep | F | 2.3 | HW Quiz |
| 2-Oct | M | Review, Chp 2 Quiz |  |
| 3-Oct | T | 2.4 |  |
| 4-Oct | W | 2.4 |  |
| 6-Oct | F | 2.4, 2.5 | HW Quiz |
| 9-Oct | M | 2.5, 2.6 |  |
| 10-Oct | T | Catch-Up, Factoring Quiz |  |
| 11-Oct | W | Review, Chp 2 Theory Quiz |  |
| 13-Oct | F | Chp 2 Test | HW Due |

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| --- | --- | --- | --- |
| **Date** | **Day** | **Class** | **Items Due** |
| 16-Oct | M | Fall Break |  |
| 17-Oct | T | Fall Break |  |
| 18-Oct | W | 3.1 |  |
| 20-Oct | F | 3.1 | HW Quiz; Chp 2 Applied Take-Home Due |
| 23-Oct | M | 3.2 |  |
| 24-Oct | T | 3.2 |  |
| 25-Oct | W | 3.3 |  |
| 27-Oct | F | 3.3 | HW Quiz |
| 30-Oct | M | Review, Chp 3 Quiz |  |
| 31-Nov | T | 3.4 |  |
| 1-Nov | W | 3.4 | DB 2 |
| 3-Nov | F | 3.5 | HW Quiz |
| 6-Nov | M | 3.5 |  |
| 7-Nov | T | Catch-Up |  |
| 8-Nov | W | Review, Chp 3 Theory Quiz |  |
| 10-Nov | F | Chp 3 Test | HW Due; Factoring Quiz Deadline |
| 13-Nov | M | 4.1 |  |
| 14-Nov | T | 4.1 | Chp 3 Applied Take-Home Due |
| 15-Nov | W | 4.2 |  |
| 17-Nov | F | 4.2 | HW Quiz |
| Thanksgiving Break - November 21-25th | | | |
| 27-Nov | M | 4.3 |  |
| 28-Nov | T | 4.4 |  |
| 29-Nov | W | 4.5 |  |
| 1-Dec | F | 4.6 | HW Quiz |
| 4-Dec | M | Chp 4 Quiz |  |
| 5-Dec | T | Review |  |
| 6-Dec | W | Review |  |
| 8-Dec | F | Review |  |
| Ma 103-1 - Final Exam - Monday, December 11th @ 12:30-1:40 p.m. | | | |
| Ma 103-2 - Final Exam - Wednesday, December 13th @ 3:30-4:40 p.m. | | | |

# MA 103 Homework Exercises

# *Algebra and Trigonometry*, Aufmann and Nation, 8th Edition

Chapter P

Section P.1 7, 9, 14, 15–23 odd; 27-33 odd; 41-47 odd, 53, 59, 61, 65, 67, 73, 78, 81, 87, 90, 91, 113-120 all, 123–127 odd [38 exercises]

Section P.2 1, 5, 9-17 odd, 21, 23, 27, 33, 39, 45, 49–55 odd, 65, 71, 74, 79, 84, 85, 89, 92, 97, 103, 105, 109, 113, 119, 125, 127, 131, 135 [35 exercises]

Section P.3 21–43 odd, 47, 49, 55, 59, 63, 65, 69, 77–89 odd [26 exercises]

Section P.4 13–29 odd, 35, 40–106 every third exercise (beginning with 40 and ending with 106) [33 exercises]

Section P.5 13, 17, 21, 24–30 even, 33, 39–45 odd, 49, 55, 57, 60, 63, 65, 71b, 72b [20 exercises]

Section P.6 9, 13, 17, 19, 23, 27, 31, 37–41 odd, 44, 45, 49, 55, 60, 61, 63, 67, 70 [18 exercises]

Chapter 1

Section 1.1 5, 9, 13, 17, 21–49 odd, 53, 55, 56, 57 [23 exercises]

Section 1.2 7–16, 17–23 odd, 27–65 odd [34 exercises]

Section 1.3 7, 9, 11, 17, 19, 31, 33, 35, 44, 47, 51, 55, 63, 73, 75, 86, 87, 89, 90, 95, 97 [21 exercises]

Section 1.4 7, 13, 15, 17, 23, 29, 31, 34, 39, 41, 43, 45, 49, 55, 59, 69, 71–79 odd, 82 [22 exercises]

Section 1.5 5, 11–25 odd, 31, 33, 39, 45, 51, 55, 57, 59, 60, 63, 64, 66, 69, 73 [23 exercises]

Section 1.6 1–11, 13–21 odd, 24, 27, 31, 33, 35, 38, 40 [23 exercises]

Chapter 2

Section 2.1 1, 3, 9, 15, 19, 22, 23, 27, 31, 35, 36, 41, 43, 45, 48, 51, 87 [17 exercises]

Section 2.2 1, 3, 4, 11, 15, 19, 23, 25, 27, 31, 33, 39, 45, 47, 51, 54, 64, 69, 73, 77, 79, 89, 91, 96, 97, 100, 108, 119, 121 [29 exercises]

Section 2.3 11, 13, 17, 21, 25, 27, 33, 36, 39, 45, 49, 53–57 all, 65, 66, 72, 75, 77, 83, 85, 89 [24 exercises]

Section 2.4 1–8, 11, 17, 21–25 odd, 33, 39, 42, 48, 50–52, 57–63 odd, 66, 67, 69, 70 [28 exercises]

Section 2.5 5–17 odd, 21, 24, 25, 29, 33, 49, 52, 53, 55, 59, 62, 71 [19 exercises]

Section 2.6 7, 10, 13, 21–43 odd, 47, 51, 56, 59, 63, 75, 80, 82, 85, 87 [25 exercises]

Chapter 3

Section 3.1 7, 13, 15, 19, 22, 23, 29, 33, 38, 39, 45, 47, 49, 53, 57, 59, 61, 64, 67, 68, 71, 73 [22 exercises]

Section 3.2 5–13 odd, 14, 15, 23–29 odd, 35, 37, 41, 47, 55, 57, 61, 63, 65, 68, 69 [22 exercises]

Section 3.3 5–15 odd, 33–39, odd, 45, 49, 58, 65, 71, 72, 76 [17 exercises]

Section 3.4 5, 9, 17, 21, 25, 36, 43, 50, 59, 65 [10 exercises]

Section 3.5 3–7 odd, 13, 14, 18, 23–27 odd, 33, 36, 48, 51, 53, 55, 59, 67, 78, 83, 85 [20 exercises]

Chapter 4

Section 4.1 5, 7, 9–13, 15, 17, 23–27 odd, 31, 35, 41, 45, 49, 55, 59 [23 exercises]

Section 4.2 5–13 odd, 19–29 odd, 33–37 odd, 49, 52, 58 [17 exercises]

Section 4.3 5–25 odd, 29, 31, 35, 37, 43, 45, 49, 51, 55, 59, 61, 65, 69, 71, 77 [26 exercises]

Section 4.4 5, 9–17 odd, 21–27 odd, 31, 35, 37, 39, 43, 57–62 all, 67, 71, 73, 76 [25 exercises]