

Ma 105  
**Trigonometry**  
*2022-23 Second Semester*

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**INSTRUCTOR INFORMATION**

Section:	Ma 105-1
Time/Room:	MWF 1:00-1:50 P.M., AI 315
Instructor:	Mr. Charles Lacey
Email:	clacey@bju.edu
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Office Hours:	By appointment at <a href="https://calendly.com/clacey-bju">https://calendly.com/clacey-bju</a>

I welcome you to contact me outside of class, especially if you are having any difficulty with your classwork. Teams or email is the best way to contact me or talk to me before or after class.

**COURSE INFORMATION****Catalog Description**

A review of the exponential, logarithmic, trigonometric functions and their graphs, trigonometric identities/equations and applications, as well as an introduction to sequences and series.  
3 credits/3 load/3 class-meetings per week

**Prerequisite**

Math ACT 26-30 or Math SAT 640-720, or Ma 103, or placement into Ma 105.

**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 83/84/89/Nspire or Nspire CAS
- Microsoft Office Lens (optional): a free app to convert handwritten work to PDF files
- Microsoft Teams (required): free app offering chat, collaboration, and conferencing

**COURSE CONTEXT****Mathematical Sciences Division Goals**

Context: The faculty of the Division of Mathematical Sciences has developed five broad goals and has aligned these goals with the Bob Jones University Institutional Goals (IG) and the goals of the BJU Core (BJUC). We believe these goals support the IG/BJUC of the University. The Division Goals (DG) are designed to develop each student to:

1. Understand the essential theory of mathematics/computer science and appropriately apply the theory in solving problems.
2. Use critical-thinking/analytical skills.
3. Understand mathematical/computing problems and design solutions with the aid of appropriate tools.
4. Apply an understanding of how mathematics/computing can be used in service to Christ as tools to the examination of the world He created.
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

1. To develop a good Christian attitude toward mathematics in general and transcendental functions in particular and to mature mathematically (DG 4, 5)
2. To develop Christ-like qualities such as perseverance, diligence, and dependence on God. (DG 4,5)
3. To develop applications of transcendental functions to solving real-life problems (DG 1, 2, 3, 4)
4. To develop an ability to recognize, manipulate, and solve expressions and equations involving the basic transcendental functions: exponential, logarithmic, and trigonometric (DG 1, 2, 3, 5)
5. To develop the ability to reason analytically in problem-solving and basic proofs (DG 1, 2)
6. To develop the ability to recognize various types of trigonometric equations and methods of solution using trigonometric identities (DG 1, 2, 3)
7. To model and solve real-life problems by using exponential and logarithmic functions and trigonometry (DG 1, 2, 3)
8. To develop an ability to use a calculator to solve exponential, logarithmic, and trigonometric problems (DG 3)

## Course Objectives

Course Objectives	Course Goals Supported	Course Content	Primary Assessment
Use a calculator and numerical computation techniques to estimate the value of the numbers such as $e$ and trigonometric function values. (NCTM A.2.1, A. 2.7) **	7, 3, 8	Chapters 4-7	Tests
Describe characteristics of relations, functions, and inverse functions in general and as applied to exponential, logarithmic, and trigonometric functions. (NCTM A.2.2, A.2.3).	4, 6	Chapters 4-7	Tests
Solve equations involving exponential, logarithmic, and trigonometric expressions. (NCTM A.2.1).	3, 4, 5, 7	Chapters 4-7	Tests
Solve applied problems by using exponential and logarithmic functions and trigonometry. (NCTM A.2.4, A.2.7, A.3.10)	1, 3, 7	Chapters 4, 5, 7	Test
Use geometric concepts such as triangles and circles to define trigonometric concepts. (NCTM A.3.4, A.3.5).	4, 5, 6	Chapter 5	Test
Graph the transcendental functions and describe the transformational effects of certain algebraic substitutions on the graph. (NCTM A.2.3, A.3.2)	4, 5, 6	Chapter 5	Test
Manipulate exponential, logarithmic, and trigonometric expressions. (NCTM A.2.1, A.2.2).	4	Chapters 4-7	Test
Recognize different types of proof, determine valid forms of proof, and apply these skills to make correct life-long decisions based on the Scripture. (NCTM A.3.9, A.3.10).	2, 5, 6	Chapter 6	Take-home Questions
Write proofs of trigonometric identities and proof by mathematical induction. (NCTM A.3.8, A.3.9, A.3.10).	4, 5	Chapter 6, 11	Quizzes and Test
Define sequences and series by $n$ th term and recursive definitions. (NCTM A.2.3).	5	Chapter 11	Quizzes
Describe geometric and arithmetic sequences and series. (NCTM A.2.3).	5	Chapter 11	Quizzes
Use the Cartesian coordinate system and graph the basic family of functions	5, 6	Unit 2	HW, Quiz
Derive the distance formula	4, 5, 6	Unit 2	HW, Quiz
Apply the basic properties of functions to determine the shapes of graphs	4, 5, 6	Unit 2	HW, Quiz

Use linear and quadratic functions to model real-life applications	2, 4, 6	Unit 2	HW
Prove the Remainder Theorem and the Factor Theorem	3, 4, 5	Unit 3	HW, Quiz
Use the Rational Zeros Theorem	3, 4, 5	Unit 3	HW, Test
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
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
Describe characteristics of relations, functions, and inverse functions	1, 3, 6	Unit 4	HW, Quiz
Derive inverse functions for one-to-one functions including exponential and logarithmic functions	3, 4, 5	Unit 4	HW, Test
Evaluate exponential and logarithmic expressions	1, 6	Unit 4	HW, Quiz
Use exponential and logarithmic functions to model real-life applications	2, 4, 6	Unit 4	HW
Solve exponential and logarithmic equations	3, 4, 5, 6	Unit 4	HW, Test
Defend or refute different viewpoints on the interconnections among mathematics, reality, philosophy, and worldview.	2, 3, 4		Discussion Posts

\*\*NCTM/CAEP Content Program Standards (2012)

## **COURSE ASSESSMENT AND GRADING**

### **Activities and Assessment**

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

<b>Category</b>	<b>% of Grade</b>	<b>Description</b>
Weekly Progress Report	9.1% 75 pts	<ul style="list-style-type: none"> <li>• Weekly Progress: <ul style="list-style-type: none"> <li>○ 15 checkpoints, 5 points each (75 points total)</li> <li>○ lowest score dropped</li> <li>○ no make-ups available</li> </ul> </li> </ul>
Discussions	2.4% 20 pts	<ul style="list-style-type: none"> <li>• Discussion Boards: Read-post-respond discussions focusing on viewpoints of mathematics (4, 5 points each)</li> </ul>
Take-home Questions	12.1% 100 pts	<ul style="list-style-type: none"> <li>• These will consist of 2-4 exercises covering topics in chapters 4, 5, 6, and 7. (4, 20-30 points each)</li> </ul>
In-class & Online Quizzes	9.7+% ≈80+ pts	<ul style="list-style-type: none"> <li>• Frequent small evaluations will help you learn the concepts better.</li> <li>• There will be occasional unannounced and/or announced quizzes in class. Always be ready.</li> <li>• There will also be regular Canvas quizzes which will be open book but will count as a quiz grade. <b>Please take these online quizzes without help from any other person.</b></li> </ul>
Tests	48.5% 400 pts	<ul style="list-style-type: none"> <li>• Unit Tests: In-class, closed-book, 50-minute tests focusing on higher-skills and applications from each unit (5, 100 points each)</li> </ul>
Final Exam	18.2% 150 pts	<ul style="list-style-type: none"> <li>• Final Exam: In-class, closed-book, multiple-choice, cumulative, 70-minute exam focusing on higher-order skills, theory, and application (1, 150 points)</li> </ul>

## 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 in mathematics includes more than just working *exercises*. Homework also includes reading and understanding how *examples* are worked, learning important *theory* (i.e., definitions, formulas and their derivations, and theorems and their proofs), and becoming proficient at using appropriate *technology*.

- Homework should be done as the material is being discussed (not right before it is due).
  - Homework cannot be done passively. Figuring out how the homework fits into the overall structure of the section will help you understand why you are doing what you are doing.
  - Keep in mind the purpose of homework - to help you master the material. Homework is not assigned to be done. It is assigned to make sure you know how to do various types of problems.
- **Evaluating Homework:** A **Weekly Progress Report** is due each Saturday and is graded by self-evaluation of performance and study habits.

## Take-home Questions

Take-home questions will be distributed in class are to be completed using your textbook and class notes. You may not receive help from any other person (except your teacher). Do not discuss these assignments among yourselves. You will be required to sign the plagiarism statement before you hand it in.

## Discussion Boards

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

- Assignments and Activities:
  - Students are expected to turn in assignments on time. Missing work will be given a grade of 0.
  - Even though assignments are collected on predetermined days, students are encouraged to complete each assignment within a day or two of the lecture covering that material.
  - Assignments may be accepted late with a 10 percent per day penalty.
- Quizzes and Tests: Missed quizzes and tests may be made up only by instructor approval given extenuating circumstances.
- Weekly Progress Reports: No late work, no make-ups will be accepted. Missing work will receive a grade of 0.

## 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 up to 30 percent.

## **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 (~825 pts). Percentages will be rounded to the nearest whole percentage when determining final grades.

## **CLASSROOM PROCEDURES**

### **Classroom Decorum**

The classroom is a professional learning environment. Students are expected to be respectful and professional in behavior, attitude, attire, and use of technology. The instructor has the right to require students who are participating in distracting, inappropriate, or unprofessional 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**

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<b>Tentative Course Schedule</b>			
Date	Day	Class	Assignment
11-Jan	W	Introduction/4.1	
13-Jan	F	4.1/4.2	<b>Bonus Quiz on the Syllabus</b>
16-Jan	M	<b>MLK Jr. Day</b>	
18-Jan	W	4.2/4.3	Sec. 4.1 5–17, 23–27, 31, 35, 41, 49, 55, 59 <b>Discussion Due – Article #17 “Why Learn Math”</b>
20-Jan	F	4.4	Sec. 4.2 7–13 odd, 19–21, 25, 27, 29, 33–39 odd, 49, 52 Sec. 4.3 7, 11, 15, 19–25 odd, 29, 31, 35, 37, 41–47 odd, 51, 55, 59, 61, 65, 70, 71, 78, 91
23-Jan	M	4.5	Sec. 4.4 7–15 odd, 21, 22, 23–31 odd, 37, 39, 43, 47, 71, 77, 81 <b>4.1-3 Online Quiz Due</b>
25-Jan	W	4.6	Sec. 4.5 9–13 odd, 18, 21, 29, 33, 39, 42, 45, 55, 57
27-Jan	F	Catch up / Review	Sec. 4.6 7, 17, 19, 25, 35, 40, 55 <b>4.4-5 Online Quiz Due</b>
30-Jan	M	<b>Chapter 4 Exam</b>	
01-Feb	W	4.7 – Modeling Data	<b>Discussion Due – Article #71 “Logarithms and Large Numbers”</b>
03-Feb	F	5.1	<b>Ch. 4 Take-home Questions Due</b>
06-Feb	M	5.2	Sec. 5.1 3, 13–17 odd, 23–29 odd, 37–41 odd, 51, 53, 61–65 odd, 70
08-Feb	W	5.3	Sec. 5.2 1, 5, 11, 13–21 odd, 27, 31, 34, 53, 60, 70
10-Feb	F	5.4	Sec. 5.3 1–15 odd, 21–31 odd, 41–45 odd, 48, 51–57 odd, 65–69 odd, 75 <b>5.1-3 Online Quiz Due</b>
13-Feb	M	5.5	Sec. 5.4 1, 3, 21–29 odd, 45–55 odd, 69, 75
Feb 14-17	T-F	<b>Bible Conference</b>	
20-Feb	M	5.6/5.7	Sec. 5.5 1–9 odd, 19–25 odd, 37, 41, 53, 59–63 odd
22-Feb	W	Catch up / Review	Sec. 5.6 1–13 odd, 23, 64 Sec. 5.7 1, 3, 7, 17, 19, 20, 21, 37, 39, 61 <b>5.4-6 Online Quiz Due</b>
24-Feb	F	<b>Chapter 5 Exam</b>	
27-Feb	M	6.1	<b>Discussion Due – “The Humanists Dilemma”</b> <b>Ch. 5 Take-home Questions Due</b>
01-Mar	W	6.2	Sec. 6.1 5–15 odd, 16, 25–33 odd, 47, 57
03-Mar	F	6.2	Sec. 6.2 9–17 odd, 25–33 odd, 43, 49, 65, 70
06-Mar	M	6.3	<b>6.1-2 Online Quiz Due</b>
08-Mar	W	6.4	Sec. 6.3 11, 13, 17, 19, 29, 47–51 odd, 59, 67, 75, 77
10-Mar	F	6.5	Sec. 6.4 11, 17, 21, 31, 37, 41, 47, 53, 55, 87 <b>6.1-4 Online Quiz Due</b>
13-Mar	M	6.6	Sec. 6.5 5, 11, 15, 17, 21–25 odd, 29–37 odd, 67
15-Mar	W	Catch up/ Review	Sec. 6.6 7, 11, 13, 19, 21, 30, 33, 38, 44, 63 <b>Ch. 5.1-6.5 Review Online Quiz Due</b>
17-Mar	F	<b>Chapter 6 Exam</b>	
<b>Spring Break</b>			
27-Mar	M	7.1	<b>Ch. 6 Take-home Questions Due</b>
29-Mar	W	7.1/7.2	Sec. 7.1 5–15 odd, 23–27 odd, 37, 39, 53
31-Mar	F	7.2	<b>Discussion Due – “Taking God Out of the Equation”</b>
03-Apr	M	7.3	Sec. 7.2 7, 11, 13, 16, 23, 24, 34, 37, 47, 51 <b>7.1-2 Online Quiz Due</b>
05-Apr	W	7.4	Sec. 7.3 11, 15–21 odd, 29, 37, 47, 49
07-Apr	F	7.5	Sec. 7.4 7, 13, 21, 25–29 odd, 45, 53, 61, 69 <b>7.3-4 Online Quiz Due</b>
10-Apr	M	Catch up/Review	Sec. 7.5 7, 11, 23–27 odd, 37, 39, 51
12-Apr	W	University Service Day	
14-Apr	F	<b>Chapter 7 Exam</b>	
17-Apr	M	11.1	<b>Ch. 7 Take-home Questions Due</b>
19-Apr	W	11.2	Sec. 11.1 7–15 odd, 27, 31–35 odd, 55, 59, 63–67 odd, 74
21-Apr	F	11.3	Sec. 11.2 5–13 odd, 21, 25–35 odd, 45, 47, 59, 61
24-Apr	M	11.4	Sec. 11.3 5–13 odd, 23, 27, 33, 37–41 odd
26-Apr	W	Catch up	Sec. 11.4 3, 7
28-Apr	F	Review	
01-May	M	<b>Final Exams</b>	<b>12:30-1:40 p.m.</b>