

M5 Additional Mathematics

Course Syllabus - 2024 Term 2

Teacher: James Jackson

Department: Mathematics

Subject Code: MA32202

Periods per week: 4

Credits: 2.0

Course Description

Students begin the course exploring vectors. They will begin by learning about properties of two-dimensional vectors as well as vector addition and scalar multiplication of vectors. Students will discover unit vectors and learn how to find the dot product of two vectors. Students will end this unit by applying what they've learned about two-dimensional vectors to vectors in three-dimensional space. The second half of the course will reintroduce students to complex numbers. Students will review imaginary numbers, learn how to perform operations on complex numbers, and find complex zeros of polynomial functions. Students will then explore polar coordinates and graphs. They will learn how to write complex numbers in polar form as well as perform operations on complex numbers in polar form.

Course Content

- 1. Unit 4: Vectors**
 - 1.1. Introduction to Vectors
 - 1.2. Vectors in the 2D coordinate plane
 - 1.3. Dot product and Vector Projections
 - 1.4. Vectors in 3D space
 - 1.5. Dot and Cross Products in 3D
- 2. Unit 5: Complex Numbers and Polynomials**
 - 2.1. Operation with complex numbers
 - 2.2. Polynomial function Solutions
 - 2.3. Roots of Polynomial functions
- 3. Unit 6: Complex Numbers and Polar Equations**
 - 3.1. Imaginary and Complex Numbers
 - 3.2. Complex Zeros of Polynomial Functions

- 3.3. Polar Coordinates
- 3.4. Complex Numbers in Polar Form
- 3.5. Introduction to Polar Equations

Learning Outcomes

Vectors

- Draw a vector in standard position given quadrant bearings or true bearings.
- Identify parallel, equivalent and opposite vectors.
- Add two vectors using the triangle method (tip-to-tail) and the parallelogram method (tail-to-tail).
- Multiply a vector by a scalar.
- Calculate the magnitude of a vector.
- Determine the direction angle of a 2D vector.
- Determine the rectangular components of a 2D vector.
- Graph a vector given in component form, matrix form, linear combination or polar form (2D).
- Express a vector in component form, matrix form, linear combination and polar form (2D).
- Find unit vectors in the same direction as a given vector.
- Calculate the dot product of two vectors
- Find the angle between two vectors with the same starting point.
- Determine if two vectors are orthogonal using the dot product.
- Graph a vector on a 3D coordinate system.
- Find the cross product of two vectors.
- Model real world situations using 3D vectors.

Complex Numbers and Polar Equations

- Simplify expressions with i .
- Write complex numbers in standard form, $a + bi$.
- Perform basic operations on complex numbers.
- Rationalize a complex expression using complex conjugates.
- Find complex zeros of a quadratic function with no real zeros.
- Identify the number of possible complex zeros of a polynomial function.
- Find complex zeros of a polynomial function.
- Write a polynomial function given its real and complex zeros.
- Graph points given with polar coordinates, (r, θ) .
- Graph simple polar equations with only the radius or angle given.
- Convert polar to rectangular coordinates.
- Convert rectangular to polar coordinates.
- Find the absolute value, $|z|$, of a complex number.
- Graph a complex number in the complex plane.
- Express a complex number in polar form.
- Convert a complex number given in polar form to rectangular form.
- Find the product and quotient of two complex numbers in polar form.
- Apply DeMoivre's Theorem to find the power of a complex number in polar form.

Learning Resources

1. Google slides lessons
2. Google Classroom
3. Handouts In Class

Assessment Methods

Learning	G - A - M - E, Projects
Assessments	Unit Exams, Quizzes, Final exam

G - Guided Practices: These assignments will be done in class following examples of new topics. They are intended to prepare you to begin the homework assignments. If you miss a class you will still be responsible for completing the exercises and submitting the google form question.

A - Individual Assignments: Use assignments to help prepare for mastery checks.

Do these to prepare you for the Mastery check. During class ask questions about what you don't understand. The material in these assignments can be slightly harder than the guided practice questions. Each assignment will have a practice and applications part.

M - Mastery Checks: Mastery checks will be done after each assignment is collected. They are intended to assess your understanding of the lesson.

E - Extra Topics: These extra assignments will either be:

1. Enrichment Topics: more advanced material to expand your knowledge or
2. Study guide and Intervention: preparatory material for those that might be struggling.

Projects: There will be a non-linear modeling project and two mini projects related to the material. If there is not enough time to complete lessons, the mini projects are subject to being canceled.

Unit Exams: These exams will be done after each unit is complete. Term 2 has 2 units and therefore 2 unit exams.

Quizzes: Quizzes will cover multiple sections in a unit. There will be 3 mid chapter quizzes. Sometimes there will be surprise quizzes on a range of topics discussed in class.

Final Exam: This exam will cover all the material for the entire term. Unit 4, 5 and 6 (Lessons 14 to 26).

Homework and Classwork Policy

An assignment that is complete and submitted on-time will receive full points.

Any complete assignment that is submitted up to 1 week late will receive $\frac{3}{4}$ points, up to 2 weeks late will receive $\frac{1}{2}$ points, and up to 3 weeks late will receive $\frac{1}{4}$ point.

Over three weeks after the due date, assignments will not be accepted and a grade of 0 will be given.

If students are absent when assignments are assigned or on an assignment due date, then it is the responsibility of the student to contact the teacher to make arrangements for submission.

Evaluation Breakdown

Assessment	30%
<ul style="list-style-type: none">• Unit Tests (20%)• Quizzes (10%)	
Student Work	40%
<ul style="list-style-type: none">• Homework/Classwork (30%)• Projects (10%)	
Final Exam	30%