Marietta City Schools

2023–2024 District Unit Planner

AP Calculus BC

Unit title	**MHS Unit 7 - AP Unit 9: Parametric Equations, Polar Coordinates, and Vector-valued Functions**	**Unit duration (hours)**	**10-12 hours**

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): ***What will students learn?***

GA DoE Standards

Standards

9.1 Defining and differentiating parametric equations
9.2 Second derivatives of parametric equations
9.3 Finding arc lengths of curves given parametric equations
9.4 Defining and differentiating vector-valued functions
9.5 Integrating vector-valued functions
9.6 Solving motion problems using parametric and vector-valued functions
9.7 Defining polar coordinates and differentiating in polar form
9.8 Find the area of a polar region or the area bounded by a single polar curve
9.9 Find the area of the region bounded by two polar curves

Concepts/Skills to support mastery of standards

- Defining and differentiating parametric equations
- Second derivatives of parametric equations
- Finding arc lengths of curves given parametric equations
- Defining and differentiating vector-valued functions
- Integrating vector-valued functions
- Solving motion problems using parametric and vector-valued functions
- Defining polar coordinates and differentiating in polar form
- Find the area of a polar region or the area bounded by a single polar curve
- Find the area of the region bounded by two polar curves

Vocabulary

Planar motion

Parametric equation

Polar coordinates

Polar equations

Vector valued equation

Notation

$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{dy}{dt} \cdot \frac{dt}{dx}$, provided $\frac{dx}{dt} \neq 0$.

Essential Questions

How can we model motion not constrained to a linear path?
How are polar equations special cases of parametric equations?
How is calculus used to analyze polar graphs and determine lengths and areas?

Assessment Tasks

List of common formative and summative assessments.

Formative Assessment(s):

Notebook, HW quizzes, AP Classroom Progress Checks

Summative Assessment(s):

Unit Test*if time allows (included in mock AP exam)

Learning Experiences

Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
9.1 Defining and differentiating parametric equations 9.2 Second derivatives of parametric equations 9.3 Finding arc lengths of curves given parametric equations	Mixed Six activity for Parametric Equations (9.1-9.3) 1. Factual recall 2. Carry out a procedure 3. Classify a mathematical object 4. Prove, show, justify 5. Extend a concept 6. Critique a fallacy	Collaborative groups Technology: desmos, graphing calculators, if desired.
9.4 Defining and differentiating vector-valued functions 9.5 Integrating vector-valued functions	Mixed Six activity for Parametric Equations (9.4-9.5) 1. Factual recall 2. Carry out a procedure 3. Classify a mathematical object 4. Prove, show, justify 5. Extend a concept 6. Critique a fallacy	Collaborative groups Technology: desmos, graphing calculators, if desired.

Content Resources

- AP Classroom (within AP Central, collegeboard.org) AP Daily videos, progress checks
- Calculus textbook: Calculus, 11e, Larson & Edwards
- Tony Record (Avon HS) created resources
- flippedmath.com
- Khan Academy
- Delta Math
- Master Math Mentor (pdf files and videos)
- Teacher created resources