Marietta City Schools

2025–2026 District Unit Planner

AP Calculus AB/BC

Unit title	**AB / BC Unit 7: (AP Unit 7 & 8) Differential Equations and Applications of Integration**	**Unit duration (hours)**	AB Unit 7: 6-8 weeks BC Unit 7: 4-5 Weeks

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

GA DoE Standards

Standards

AP Calc AB/BC 7.1-7.4, 7.6-7.8; 8.1-8.12
BC only includes 7.5, 7.9

7.1 Modeling situations with differential equations
7.2 Verifying solutions for differential equations
7.3 Sketching slope fields
7.4 Reasoning using slope fields
*7.5 Approximating solutions using Euler's method
7.6 Finding general solutions using separation of variables
7.7 FInding particular solutions using initial conditions and separation of variables
7.8 Exponential models with differential equations
*7.9 Logistic models with differential equations
8.1 Finding the average value of a function on an interval
8.2 Connecting position, velocity, and acceleration of functions using integrals
8.3 Using accumulation functions and definite integrals in applied contexts
8.4 Finding the area between curves expressed as functions of x
8.5 Finding the area between curves expressed as functions of y
8.6 Finding the area between curves that intersect at more than two points
8.7 Volumes with cross sections: squares and rectangles
8.8 Volumes with cross sections: triangles and semicircles

8.9 Volume with disc method: revolving around the x- or y-axis
8.10 Volume with disc method: revolving around other axes
8.11 Volume with washer method: Revolving around the x- or y-axis
8.12 Volume with washer method: revolving around other axe

Concepts/Skills to support mastery of standards

- Modeling situations with differential equations
- Verifying solutions for differential equations
- Sketching slope fields
- Reasoning using slope fields
- Approximating solutions using Euler's method
- Finding general solutions using separation of variables
- Finding particular solutions using initial conditions and separation of variables
- Exponential models with differential equations
-

Vocabulary

General solution, differential equation, families of functions, anti differentiation, separation of variables, particular solution, domain restrictions,

Notation

FUN-7.E.2
The function F defined by $F(x)=y_0+\int_a^x f(t)dt$ is a particular solution to the differential equation $\frac{dy}{dx}=f(x)$, satisfying $F(a)=y_0$.

The model for exponential growth and decay that arises from the statement "The rate of change of a quantity is proportional to the size of the quantity" is $\frac{dy}{dt}=ky$.

FUN-7.G.1
The exponential growth and decay model, $\frac{dy}{dt}=ky$, with initial condition $y=y_0$ when $t=0$, has solutions of the form $y=y_0e^{kt}$.

Essential Questions

How can you set up and solve separable differential equations?
How are slope fields used to represent solution curves to differential equations?
How are differential equations related to exponential growth, exponential decay and logistic growth curves?

Assessment Tasks

List of common formative and summative assessments.

Formative Assessment(s):

Hw, skills checks, quizzes, AP classroom assignments, progress checks

Summative Assessment(s): Unit test

Learning Experiences

Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
	7.3 **Match Mine** Give student pairs a blank 3×3 game board and nine graphs of slope fields, each on a separate card. Some should be in terms of x only, some in terms of y only, and some in terms of x and y. Be sure to include at least one trigonometric function. Student A arranges the graphs on the grid without showing Student B and then describes the arrangement so Student B can try to match it on their own board. **7.6** **Numbered Heads Together** Have each student complete the same problem individually (e.g., $y' = 2xy^2$, $\frac{dy}{dx} = y^2 + 1$, or $3y\,dy = (x^2+1)\,dx$). Make sure to use a variety of notation in whatever problem you pick. Then have students compare answers and procedures within groups. Students fix any mistakes until they all agree on the same answer. **7.7** **7.8** **Collaborative Poster** Assign each student a role within their group: • Separating the variables • Integrating both sides • Finding C • Writing the final particular solution Then distribute a free-response question to each group and have them work on their assigned roles to solve the problem together. Examples include the following: • 2002 Form B #5(b) (not transcendental) • 2011 #5(c) (transcendental) • 2012 #5(c) (transcendental) • 2014 #6(c) (transcendental)	

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 • Khan Academy • Delta Math • Master Math Mentor (pdf files and videos) • Interactive NB pages • Teacher created resources