



Marietta City Schools
2024–2025 District Unit Planner

AP Calculus AB

Unit title	Unit 7: Differential Equations	Unit duration (hours)	<i>7.5 - 10 hours</i>
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Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): *What will students learn?*

GA DoE Standards

Standards

- 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

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

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Vocabulary

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

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 $y = y_0e^{kt}$.

Notation

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
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	<p>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.</p> <hr/> <p>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 $3ydy = (x^2 + 1)dx$). 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.</p> <hr/> <p>7.7 Collaborative Poster 7.8 Assign each student a role within their group:</p> <ul style="list-style-type: none"> • Separating the variables • Integrating both sides • Finding C • Writing the final particular solution <p>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:</p> <ul style="list-style-type: none"> • 2002 Form B #5(b) (not transcendental) • 2011 #5(c) (transcendental) • 2012 #5(c) (transcendental) • 2014 #6(c) (transcendental) 	
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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