**Marietta City Schools**

**2023–2024 District Unit Planner**

*AP Calculus AB*

| **Unit title** | **Unit 4: Contextual Applications of Differentiation** | **Unit duration (hours)** | **2-3 weeks** |
|---|---|---|---|

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

**GA DoE Standards**

**Standards**

4.1 Interpreting the meaning of the derivative in context
4.2 Straight-line motion: Connecting position, velocity, and acceleration
4.3 Rates of change in applied contexts other than motion
4.4 Introduction to related rates
4.5 Solving related rates problems
4.6 Approximating values of a function using local linearity and linearization
4.7 Using L'Hospital's rule for determining limits of indeterminate forms

**Concepts/Skills to support mastery of standards**

- Interpreting the meaning of the derivative in context
- Straight-line motion: Connecting position, velocity, and acceleration
- Rates of change in applied contexts other than motion
- Introduction to related rates
- Solving related rates problems
- Approximating values of a function using local linearity and linearization
- Using L'Hospital's rule for determining limits of indeterminate forms

- Emphasize that students must verify that $\lim_{x \to a} f(x) = \lim_{x \to a} g(x) = 0$ (or that both approach infinity) as a necessary first step before applying L'Hospital's Rule to determine $\lim_{x \to a} \frac{f(x)}{g(x)}$. Students should understand that $\frac{0}{0}$ or $\frac{\infty}{\infty}$ are appropriate labels for indeterminate forms but do not represent values in an equation. Therefore, it is incorrect to write $\lim_{x \to a} \frac{f(x)}{g(x)} = \frac{0}{0}$, for example. Note that $\lim_{x \to a} \frac{f(x)}{g(x)} \neq \frac{\lim_{x \to a} f(x)}{\lim_{x \to a} g(x)}$ when $\lim_{x \to a} g(x) = 0$. Also emphasize that the conclusion of L'Hospital's rule features the ratio of the derivatives of the numerator and denominator, respectively, rather than the derivative of the ratio.

**Vocabulary**

Straight line motion - Position, Velocity, Acceleration

Related Rates

Local Linearity

Indeterminate form

L'Hospital's Rule

Linearization

**Notation**

**ESSENTIAL KNOWLEDGE**

**LIM-4.A.1**

When the ratio of two functions tends to $\frac{0}{0}$ or $\frac{\infty}{\infty}$ in the limit, such forms are said to be indeterminate.

**ESSENTIAL KNOWLEDGE**

**CHA-3.A.1**

The derivative of a function can be interpreted as the instantaneous rate of change with respect to its independent variable.

**CHA-3.A.2**

The derivative can be used to express information about rates of change in applied contexts.

**CHA-3.A.3**

The unit for $f'(x)$ is the unit for $f$ divided by the unit for $x$.

**Essential Questions**

How are derivatives used to solve problems regarding position, velocity, and acceleration?
How can you use related rates to solve problems with multiple variables changing?
How can we use L'Hopitals rule to determine the limit of an equation with an indeterminate form?

**Assessment Tasks**

*List of common formative and summative assessments.*

**Formative Assessment(s):**

Skills Checks

HW

Quizzes

Progress CHecks in AP Classroom

**Summative Assessment(s):**

Unit Test

| **Learning Experiences**<br>Add additional rows below as needed. | | |
|---|---|---|
| **Objective or Content** | **Learning Experiences** | **Personalized Learning and Differentiation** |
| 4.7 Using L'Hospital's rule for determining limits of indeterminate forms | http://secure-media.collegeboard.org/ap/pdf/ap18-sg-calculus-ab.pdf<br><br>Exam FR guidelines<br><br>Students will analyze/evaluate work compared to scoring guidelines. | Collaborative groups and extensions on AP classroom as necessary |
| 4.7 Using L'Hospital's rule for determining limits of indeterminate forms | https://secure-media.collegeboard.org/digitalServices/pdf/ap/ap18-calculus-ab-q5.pdf<br><br>Exam FR samples<br><br>Students will evaluate other student samples according to scoring guidelines. | Collaborative groups and extensions on AP classroom as necessary |
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| **Content Resources** | | |
| ● AP Classroom (within AP Central, collegeboard.org)<br>● Calculus textbook: Calculus, 11e, Larson & Edwards<br>● Tony Record (Avon HS) created resources<br>● Khan Academy<br>● Delta Math<br>● Master Math Mentor (pdf files and videos)<br>● Teacher created resources | | |