### IB AA HL Yr 2 Unit 1 Topic 5 Calculus Planner

<table>
<thead>
<tr>
<th>Teacher(s)</th>
<th>Joanna Smith</th>
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</table>
| **Course part and topic** | Unit 1 - Calculus  
Topic 5: AHL 5.12 - 5.19; AHL 1.11  
SL Review 5.1 - 5.11 |
| **Subject group and course** | Mathematics – Analysis and Approaches  
SL or HL/Year 1 or 2 |
| **Dates** | August - September |

#### Unit description and texts

Calculus describes rates of change between two variables and the accumulation of limiting areas. The aim of the AHL content in the calculus topic is to extend and build upon the aims, concepts and skills from the SL content. Further powerful techniques and useful applications of differential and integral calculus are introduced.

Text – Oxford Mathematics Analysis and Approaches HL (Ch. 4, Ch. 7, Ch. 8)

#### INQUIRY: establishing the purpose of the unit

**Transfer goals**

*List here one to three big, overarching, long-term goals for this unit. Transfer goals are the major goals that ask students to “transfer” or apply their knowledge, skills, and concepts at the end of the unit under new/different circumstances, and on their own without scaffolding from the teacher.*

Students should be able to:

- Use rates of change (derivatives) and accumulations (integration) to model, interpret and analyze real-world problems and situations.
- Understand the behaviour of functions and interpret the features of their graphs.
### Content/skills/concepts—essential understandings

Students will know the following content:
- Finding higher derivatives
- Technique of implicit differentiation
- Derivatives and indefinite integrals of tanx, secx, cosecx, cotx, a^x, log_a x, and the inverse trig functions
- Integration by substitution and by parts
- Solve differential equations
- Euler’s method

Students will develop the following skills:
- Use limits and the definition of derivative from first principles to find the derivative of a function.
- Evaluating limits using l’Hospital’s rule or the Maclaurin series
- Interpret and solve optimization and related rates problems.
- Using partial fractions to rearrange an integrand
- Finding the area of a region and volumes of revolution
- Use of simple substitution, products, integration and differentiation to obtain other series

Students will grasp the following concepts:
- Some functions may be continuous everywhere but not differentiable everywhere.
- A finite number of terms of an infinite series can be a general approximation of a function over a limited domain.
- Limits describe the output of a function as the input approaches a certain value and can represent convergence and divergence.
- Examining limits of functions at a point can help determine continuity and differentiability at a point.

### Learning process
- Check the boxes for any pedagogical approaches used during the unit. Aim for a variety of approaches to help facilitate learning.

Learning experiences and strategies/planning for self-supporting learning:
- ☒ Lecture
- ☐ Socratic seminar
- ☒ Small group/pair work
- ☐ PowerPoint lecture/notes
- ☒ Individual presentations
- ☐ Group presentations
- ☐ Student presentations
- ☐ Interdisciplinary learning

Details:
Most lessons will start with direct instruction and introduction from the instructor. Students will work in small groups to solve problems and complete explorations—some will be consistent across groups, some will be unique allowing for each group/individual to have time to present their work. Discussions regarding method, alternate approaches, and efficiency will be regularly included in the class.

- ☐ Other/s:

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Resources, materials, assessments not linked to SGO or unit planner will be reviewed at the local school level.
<table>
<thead>
<tr>
<th>Formative assessment:</th>
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<tbody>
<tr>
<td>Unit 1 Quizzes</td>
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<tr>
<td>Textbook practice problems</td>
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<tr>
<td>SL Review Question Sets from Question bank</td>
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<th>Summative assessment:</th>
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<td>Summative Assessments -</td>
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<tr>
<td>Topic 5 pt. 1</td>
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<td>Topic 5 pt. 2</td>
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Questions for the cumulative assessments come from released questions in the IB Question bank. Each summative assessment is cumulative by semester with the majority (60-75%) of the test coming from the content covered between summative assessments. Content will also include daily warmup topics from the time period between assessments (review of SL topics).

<table>
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<tr>
<th>Differentiation:</th>
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<tbody>
<tr>
<td>☐ Affirm identity</td>
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<td>☒ Value prior knowledge</td>
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<tr>
<td>☐ Scaffold learning</td>
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<tr>
<td>☒ Extend learning</td>
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The aim of the AHL content in the calculus topic is to extend and build upon the aims, concepts and skills from the SL content. Further powerful techniques and useful applications of differential and integral calculus are introduced.

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Approaches to learning (ATL)

*Check the boxes for any explicit approaches to learning connections made during the unit. For more information on ATL, please see the guide.*

<table>
<thead>
<tr>
<th>Thinking</th>
<th>Social</th>
<th>Communication</th>
<th>Self-management</th>
<th>Research</th>
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Details:
- **Thinking** - making connections within the content and applications
- **Social** – partner work
- **Communication** – utilizing the language and notation of mathematics
- **Self-Management** - students will have problems sets to complete that will need to be balanced with their other time commitments and responsibilities.

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### Language and learning

*Check the boxes for any explicit language and learning connections made during the unit. For more information on the IB’s approach to language and learning, please see the guide.*

- ☒ Activating background knowledge
- ☐ Scaffolding for new learning
- ☒ Acquisition of new learning through practice
- ☐ Demonstrating proficiency

**Details:**

Students will use the language of mathematics in connection to prior knowledge of calculus from IB AA SL. Students will learn new vocabulary, formats and notation related to Calculus and gain mastery of them through practice.

### TOK connections

*Check the boxes for any explicit TOK connections made during the unit*

- ☒ Personal and shared knowledge
- ☒ Ways of knowing
- ☐ Areas of knowledge
- ☐ The knowledge framework

**Details:**

- Can a mathematical statement be true before it has been proven?
- Does personal experience play a role in the formation of knowledge claims in mathematics? Does it play a different role in mathematics compared to other areas of knowledge?
- Is there always a trade-off between accuracy and simplicity?

### CAS connections

*Check the boxes for any explicit CAS connections. If you check any of the boxes, provide a brief note in the “details” section explaining how students engaged in CAS for this unit.*

- ☐ Creativity
- ☐ Activity
- ☐ Service

**Details:** N/A

### Resources

*List and attach (if applicable) any resources used in this unit*

- Textbook - Mathematics: Analysis and Approaches HL (Oxford – 2019) (Ch. 4, Ch. 7, Ch. 8)
- IB QuestionBank
- Revision Village Website videos and Question banks

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