

## YEAR 11 - MATHEMATICS

### Preliminary Topic 18(1) - Gradients of Tangents (2)

## MATHEMATICS ADVANCED

### LEARNING PLAN

| Learning Intentions<br>Student is able to:                                          | Learning Experiences<br>Implications, considerations and implementations:                                                                                                                          | Success Criteria<br>I can:                                                                                                                                                                          | Resources                                                                                                                                                                                                         |
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| Model, analyse and solve problems involving linear functions.                       | Review the linear equation $y = mx + c$ as previously studied in Stage 5.2 and Stage 5.3.                                                                                                          | <ul style="list-style-type: none"> <li>Model a problem using the equation of a straight line in the form <math>y = mx + c</math></li> <li>Solve problems modelled on the linear equation</li> </ul> | A module of work on coordinate geometry:<br><a href="http://amsi.org.au/teacher_modules/introduction_to_coordinate_geometry.html">http://amsi.org.au/teacher_modules/introduction_to_coordinate_geometry.html</a> |
| Explain the geometrical significance of $m$ and $c$ in the equation $f(x) = mx + c$ | Students investigate the significance of $m$ and $c$ using graphical technology and a constant controller. They explore the meaning of $m$ and $c$ when $y$ and $x$ represent specific quantities. | <ul style="list-style-type: none"> <li>Explain the significance of the gradient in relation to the problem being modelled</li> </ul>                                                                |                                                                                                                                                                                                                   |

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|                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>Describe the significance of the constant, <math>c</math>, in the model</li> </ul>                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Distinguish between continuous and discontinuous functions, identifying key elements which distinguish each type of function | <p>Students sort a variety of different line graphs into groups that have a common feature in regard to their shape.</p> <p>The set of graphs provided could include:</p> <ul style="list-style-type: none"> <li>those from newspapers and magazines,</li> <li>graphs from practical situations such as parking station fees,</li> <li>piecewise graphs,</li> <li>graphs already met in this course and unfamiliar graphs sourced from later topics in this course or elsewhere.</li> </ul> | <ul style="list-style-type: none"> <li>Describe a sorting strategy using terms such as broken, unbroken, jump, restricted, in pieces, finite and infinite.</li> <li>Select appropriate language for describing graphs that have a break, using the terms ‘continuous’ and ‘discontinuous’.</li> <li>Sort graphs using the new categories and then further sort the discontinuous graphs into those that have an asymptote, a jump or a hole.</li> </ul> | <p>Limits and continuity activities:</p> <p><a href="https://www.geogebra.org/m/jR5qtBfh">https://www.geogebra.org/m/jR5qtBfh</a></p> <p><a href="https://teacher.desmos.com/activitybuilder/custom/574de5cdab71b5085a2aad42">https://teacher.desmos.com/activitybuilder/custom/574de5cdab71b5085a2aad42</a></p> <p><a href="https://www.math.brown.edu/utra/disccontinuities.html">https://www.math.brown.edu/utra/disccontinuities.html</a></p> <p><a href="http://www.themathpage.com/acalc/continuous-function.htm">http://www.themathpage.com/acalc/continuous-function.htm</a></p> |
| Sketch graphs of functions that are continuous and compare them with graphs of functions that have discontinuities           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>Sketch a variety of graphs which are continuous or discontinuous in nature</li> </ul>                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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|                                                                                     |                                                                                                                                                             | <ul style="list-style-type: none"> <li>Compare continuous and discontinuous graphs</li> </ul>                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Describe continuity informally, and identify continuous functions from their graphs |                                                                                                                                                             | <ul style="list-style-type: none"> <li>Identify continuous functions from their graphs</li> <li>Describe what is meant by cont</li> </ul> | <p>A description of continuity and discontinuity can be found here:<br/> <a href="https://www.math.brown.edu/utra/discontinuities.html">https://www.math.brown.edu/utra/discontinuities.html</a><br/> <a href="http://www.thematpage.com/acalc/continuous-function.htm">http://www.thematpage.com/acalc/continuous-function.htm</a></p> <p>A description of limits and continuity can be found here:<br/> <a href="https://www.geogebra.org/m/jR5qtBfh">https://www.geogebra.org/m/jR5qtBfh</a><br/> <a href="https://teacher.demos.com/activitybuilder/custom/574de5cdab71b5085a2aad42">https://teacher.demos.com/activitybuilder/custom/574de5cdab71b5085a2aad42</a></p> |
| Describe the gradient of a secant drawn through two nearby points                   | Students use a variety of graphs representing practical situations (eg the price of a house over time) and describe what information the graph illustrates. | <ul style="list-style-type: none"> <li>Calculate the gradient of the</li> </ul>                                                           | Exploring Gradient workbook:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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| <p>on the graph of a continuous function as an approximation of the gradient of the tangent to the graph at those points, which improves in accuracy as the distance between the two points decreases</p>                                                             |                                                                                                                                                                                                                                                                                            | <p>secant joining two points on a graph</p> <ul style="list-style-type: none"> <li>• Describe the effect of moving the two points closer together</li> <li>• Deduce an approximate gradient for the tangent to a graph at a particular point</li> </ul>                                                                                                                   | <p><a href="https://www.geogebra.org/m/anYSW7fG">https://www.geogebra.org/m/anYSW7fG</a></p> |
| <p>Examine and use the relationship between the angle of inclination of a line or tangent, <math>\theta</math>, with the positive <math>x</math>-axis, and the gradient, <math>m</math>, of that line or tangent, and establish that <math>\tan \theta = m</math></p> | <p>Review the concept of the gradient of an interval joining two points on the Cartesian plane as <math>m = \frac{\text{rise}}{\text{run}}</math>.</p> <p>Use graphing software to explore the gradient of a line and the effect of changing the gradient on the angle of inclination.</p> | <ul style="list-style-type: none"> <li>▪ distinguish between positive and negative gradient.</li> <li>▪ link negative gradient to a negative angle of inclination.</li> <li>▪ describe how the angle of inclination is related to the gradient.</li> <li>▪ use the formula</li> <li>▪ <math>\tan \theta = m</math> to find the angle of inclination of a line.</li> </ul> |                                                                                              |