VCE Specialist Mathematics   
Units 3 and 4

Sample learning activity – Quadratic reciprocal and rational functions

Introduction

This learning activity provides the opportunity to explore key features of graphs of quadratic reciprocal and rational functions, that is functions with rules of the form

 and  respectively.

Simple cases can be sketched by hand, with more general investigation assisted by technology.

Part 1

Consider the function with rule  where.

1. Find the derivative of the function and investigate the location and nature of any stationary points for different combinations of values of the coefficients.
2. Plot the corresponding graphs, and state the equations of any asymptotes and the maximal domain and range.
3. Classify the forms of the graphs in terms of the discriminant of the quadratic function.

Part 2

Consider the function with rule  where .

Carry out similar analysis for this type of function, including consideration of horizontal axis intercepts and points of inflection.

Areas of study

The following content from the areas of study is addressed through this task.

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| --- | --- | --- |
| **Area of study** | **Topics** | **Content dot point** |
| Functions, relations and graphs | Functions, relations and graphs | 1, 2, 3 |
| Calculus | Differential and integral calculus | 2, 3 |

Outcomes

The following outcomes, key knowledge and key skills are addressed through this task.

|  |  |  |
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| **Outcome** | **Key knowledge dot point** | **Key skill dot point** |
| **1** | 3, 6, 7, 8 | 2, 6, 7 |
| **2** | 1, 2, 3, 4, 5 | 1, 2, 3, 5, 6 |
| **3** | 1, 2, 3, 5, 6, 7 | 1, 2, 3, 4, 5, 6, 8, 9, 10, 11 |