VCE Mathematical Methods Unit 3

Sample application task: Graphs of products of polynomials

Introduction

A context such as the following could be used to investigate key features of the graphs of some polynomial functions of a real variable formed by products of other polynomial functions.

For each of the following functions the behaviour and variety of shapes of their graphs is to be investigated. The maximal domain and corresponding range should be identified, as well as key features such as axis intercepts, stationary points, points of inflection and symmetry, and the shape of the graph over its natural domain, using the derivative function for analysis as applicable.

The number, location and nature of key features should be determined with respect to different combinations of the parameters that define the product functions, and the different types of graphs identified and classified.

Part 1

Investigate the nature of graphs of polynomial product functions of the form



where *n and m* are positive integers and .

Part 2

Investigate the nature of graphs of polynomial product functions of the form



where *n and m* are positive integers and .

Part 3

Investigate the nature of graphs of polynomial product functions of the form



where *n and m* are positive integers and *a* and *b* are real numbers such that .

Areas of study

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

|  |  |
| --- | --- |
| **Area of study** | **Content dot points** |
| Functions, relations and graphs | 1, 4, 5  |
| Algebra, number and structure | 1, 2, 5  |
| Calculus | 1, 3, 4, 5 |
| Data analysis, probability and statistics | – |

Outcomes

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

|  |  |  |
| --- | --- | --- |
| **Outcome** | **Key knowledge dot points** | **Key skills dot points** |
| 1 | 1, 2, 7, 9, 10, 11 | 1, 2, 5, 6, 7, 9, 10, 11, 12 |
| 2 | 1, 2, 3, 5 | 1, 2, 4, 5, 6, 7 |
| 3 | 1, 2, 3, 4, 5, 6, 8 | 1, 2, 3, 4, 5, 6, 7, 9, 11, 12 |