VCE Mathematical Methods Unit 3

Sample application task: Investigating some polynomial functions

The application task is to be of 4–6 hours’ duration over a period of 1–2 weeks.

Introduction

A context such as the following could be used to develop an application task that investigates graphs of polynomial functions of the form, the key features of these graphs, and the number of solutions to equations of the form

Component 1

*Introduction of the context through specific cases or examples. Students should*

1. Consider the function. Sketch the graph of , and clearly indicate all key features. Find the values of *x* for which has one, two or three solutions,   
   where *p* is a real number.
2. State the transformations required to map the graph of onto the graph of .   
   If there is a turning point at (2, 3), find all possible values of *n* and *k*. Sketch the corresponding graphs.
3. State the transformations required to map the graph of onto the graph of   
   . If there is a turning point at (–1, 4), find all possible values of *A* and *h*. Sketch the corresponding graphs.
4. The graph of is mapped onto graph of . Discuss how the values of   
   *A*, *n*, *h* and *k* change the graph of the original function under various transformations.

Component 2

*Consideration of general features of the context. Students should*

1. Now consider the function where   
   Investigate the graphs of for combinations and ranges of values of the parameters *a*, *b* and *m*.
2. In each of the cases in step a., find the values of for which has one, two or three solutions.
3. State the transformations required to map the graph of onto the graph of  
   , where *A,* *n* and *k* . Investigate how *A,* *n* and *k,* and *a, b* and *m* relate to the location and nature of the stationary points of the graph of .

Component 3

*Variation or further specification of assumption or conditions involved in the context to focus on a particular feature or aspect related to the context. Students should*

1. Consider the function , where and Investigate the graphs of for cases where and What generalisations can be made?
2. Let where and . Find the values of *p* for which has zero, one, two or three solutions when *s* = 1, 2, 3, 4 and 5. What generalisations can be made?

Areas of study

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

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

Outcomes

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

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