VCE Mathematical Methods Unit 1

Unit 1 Area of Study 2: Algebra, number and structure

Example of learning activity: Are there rational roots?

Introduction

This learning activity explores when quadratic functions of the form $f:R\rightarrow R, f\left(x\right)=ax^{2}+bx+c$ $a\ne 0$ have rational roots or not.

Part 1

Consider the family of quadratic functions defined by



Identify values of *b* for which *f* has rational roots and illustrate these with their corresponding graphs.

Investigate for other integer values of *c*.

Part 2

Consider the family of quadratic functions defined by



Identify integer values of *c* for which *f* has rational roots and illustrate some of these with their corresponding graphs.

Investigate for other integer values of *b*.

Part 3

Use the rational root theorem to decide if the quadratic function $f\left(x\right)=2x^{2}+3x-7$ has rational roots. Repeat this for several other choices of small integer values for the coefficients *a*, *b* and *c*.

The discriminant can also be used to determine whether a quadratic function has rational roots or not. Identify how this can be done by considering the discriminant of several quadratic functions that have rational roots.

Areas of study

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

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| **Unit 1** |
| **Area of study** | **Content dot points** |
| Functions, relations and graphs | – |
| Algebra, number and structure | 1, 2, 3, 4, 6 |
| Calculus | – |
| Data analysis, probability and statistics  | – |

Outcomes

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

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| **Unit 1** |
| **Outcome** | **Key knowledge dot point(s)** | **Key skills dot points** |
| 1 | 6 | 2, 4 |
| 2 | 2, 3 | 3, 5, 6 |
| 3 | 4 | 3, 4, 5 |