VCE Mathematical Methods
Units 3 and 4

Areas of Study 1 and 3

Example of learning activity: Antiderivatives from derivatives

Introduction

This learning activity looks at how differentiation of particular functions with rules of the form $x^{n}×f\left(x\right)$, where *n* is a positive integer, leads to finding an antiderivative of a closely related function. This technique
is sometimes known as integration by recognition.

Part 1

Let $f\left(x\right)=e^{x}$ and consider derivatives of functions of the form $x^{n}e^{x}$.

1. Differentiate $xe^{x}$ and hence find an antiderivative for $xe^{x}$.
2. Differentiate $x^{2}e^{x}$ and hence find an antiderivative for $x^{2}e^{x} $.
3. Differentiate $x^{3}e^{x}$ and hence find an antiderivative for $x^{3}e^{x} $.

Describe a general process for finding an antiderivative for $x^{n}e^{x}$.

Part 2

Repeat this analysis for:

1. $f\left(x\right)=sin⁡(x)$
2. $f\left(x\right)=log\_{e}(x)$.

Areas of study

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

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

Outcomes

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

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| **Units 3 and 4** |
| **Outcome** | **Key knowledge dot points** | **Key skills dot points** |
| 1 | 1, 4, 7, 10 | 1, 11, 13 |
| 2 | 1, 2, 5 | 1, 2, 3, 6 |
| 3 | 3, 4 | 3, 5, 6 |