



Mathematics Department

A Level Further Mathematics Preparation Work

The problems in this booklet are to be completed over the summer to help prepare you for A level Further Mathematics.

The main focus is to allow you to develop your problem solving skills and to demonstrate your written communication skills.

You will want to consider whether your solutions are complete and rigorous, whether you have conveyed your working using appropriate mathematical notation, and whether you have fully justified your findings.

Your answers should be written on A4 lined paper and will be collected in the first lesson you have at Beverley Grammar School. In this lesson you will be expected to present and discuss your solutions with your peers.

Problem 1

List all the real numbers x such that

$$(x - 5)^{x^2 - 4} = 1$$

Problem 2

Prove that there are no positive integer solutions to the Diophantine equation $x^2 - y^2 = 1$.

Problem 3

Given the pair of simultaneous equations

$$\begin{aligned} ax + 2y &= 1 \\ 2x + ay &= b \end{aligned}$$

under what conditions on a and b does there exist

- (i) a unique solution,
- (ii) no solution,
- (iii) an infinite number of solutions?

Problem 4

The circle in the diagram has radius 6 cm.

If the perimeter of the rectangle is 28 cm, what is its area?

