Chapter 3

Equations and Inequalities

Chapter Overview

1. Simultaneous Equations

2. Simultaneous Equations Using Graphs

3. Set Builder Notation

4. Solving Inequalities

5. Sketching Inequalities





Simultaneous Equations

Linear Equations:

Example:

Solve the simultaneous equations

Method 1 : Elimination Method 2: Substitution

Exercise 3A Page 40

Linear and Quadratic

Example:

Solve the simultaneous equations:

Test Your Understanding:

1. Solve the simultaneous equations: and

Extension:

1.

*[MAT 2012 1G]* There are *positive* real numbers and which solve the equations

for:

A) All values of ;

B) No values of ;

C) only;

D) Only

*[STEP 2010 Q1]* Given that

a) Find the values of .

b) Solve the simultaneous equations:

(Hint: Can we use the same method in (a) to rewrite the second equation?)

2.

Exercise 3B Page 41

Simultaneous Equations and Graphs

Examples:

1a. On the same axes, draw the graphs of and

1b. Use your graph to write down the solutions to the simultaneous equations

1c. What algebraic method could we have used to show the graphs would have intersected twice?

Example 2

a) On the same axes, draw the graphs of:

b) Prove algebraically that the lines never meet

Question: The line with equation meets the curve with equation at exactly one point. Given that is a positive constant:

a) Find the value of .

b) For this value of , find the coordinates of this point of intersection

Exercise 3C Page 45

Set Builder Notation

Recap from GCSE:

* We use curly braces to list the values in a set, e.g.
* If and are sets then is the **intersection** of and , giving a set which has the elements in **and** .
* is the **union** of and , giving a set which has the elements in **or** in .
* is the empty set, i.e. the set with nothing in it.
* Sets can also be infinitely large. is the set of natural numbers (all positive integers), is the set of all integers (including negative numbers and 0) and is the set of all real numbers (including all possible decimals).
* We write to mean “ is a member of the set A”. So
* ould mean “ is a real number”.

 **Examples:**

Example

Examples:

1.

2.

3.

Solving Inequalities

Linear inequalities Examples

2.

1.

3.

Combining Inequalities

When combining inequalities always draw a number line to help!

Example

Example:

If and , what is the combined solution set?

Quadratic Inequalities:

Example

Examples

1. Solve

2. Solve

3. Solve

4. Solve

Test Your Understanding

 



Division by x

Find the set of values for which

Exercise 3D/ 3E Page 47 – 51

 45

Sketching Inequalities:

Examples

1. has equation . has equation .

The diagram shows a sketch of and on the same axes.

1. Find the coordinates of and , the points of intersection.
2. Hence write down the solution to the inequality

.

2. Shade the region that satisfies the inequalities:



Exercise 3F/ 3G Page 53 – 55

 45