**Semester 1 (Unit 3) Examination, 2017**

**Question/Answer Booklet**

**MATHEMATICS SPECIALIST**

**Section One: Calculator-free**

Student Name/Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Teacher Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Time allowed for this section**

Reading time before commencing work: five minutes

Working time for this section: fifty minutes

**Materials required/recommended for this section**

**To be provided by the supervisor:** This Question/Answer Booklet

Formula Sheet

**To be provided by the candidate:**

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,

correction fluid/tape, eraser, ruler, highlighters

Special items: nil

**Important note to candidates**

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

**Structure of this paper**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Section | Number of questions available | Number of questions to be answered | Working time (minutes) | Marks available | Percentage of exam |
| Section One: Calculator-free | 7 | 7 | 50 | 52 | 35 |
| Section Two: Calculator-assumed | 10 | 10 | 100 | 92 | 65 |
|  | | | | | 100 |

**Instructions to candidates**

1. The rules for the conduct of School exams are detailed in the *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_School/College assessment policy*. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer Booklet.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

1. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
   * Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
   * Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.
2. **Show all working clearly.** Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat any question, ensure that you cancel the answer you do not wish to have marked.
3. It is recommended that you **do not use pencil**, except in diagrams.
4. The Formula Sheet is **not** to be handed in with your Question/Answer Booklet.

**Section One: Calculator-free (52 Marks) Weighting 35%**

This section has 7 questions. Answer **all** questions. Write your answers in the spaces provided.

Spare pages are included at the end of this booklet.

Suggested working time: **50 minutes**.

**Question 1 (9 marks)**

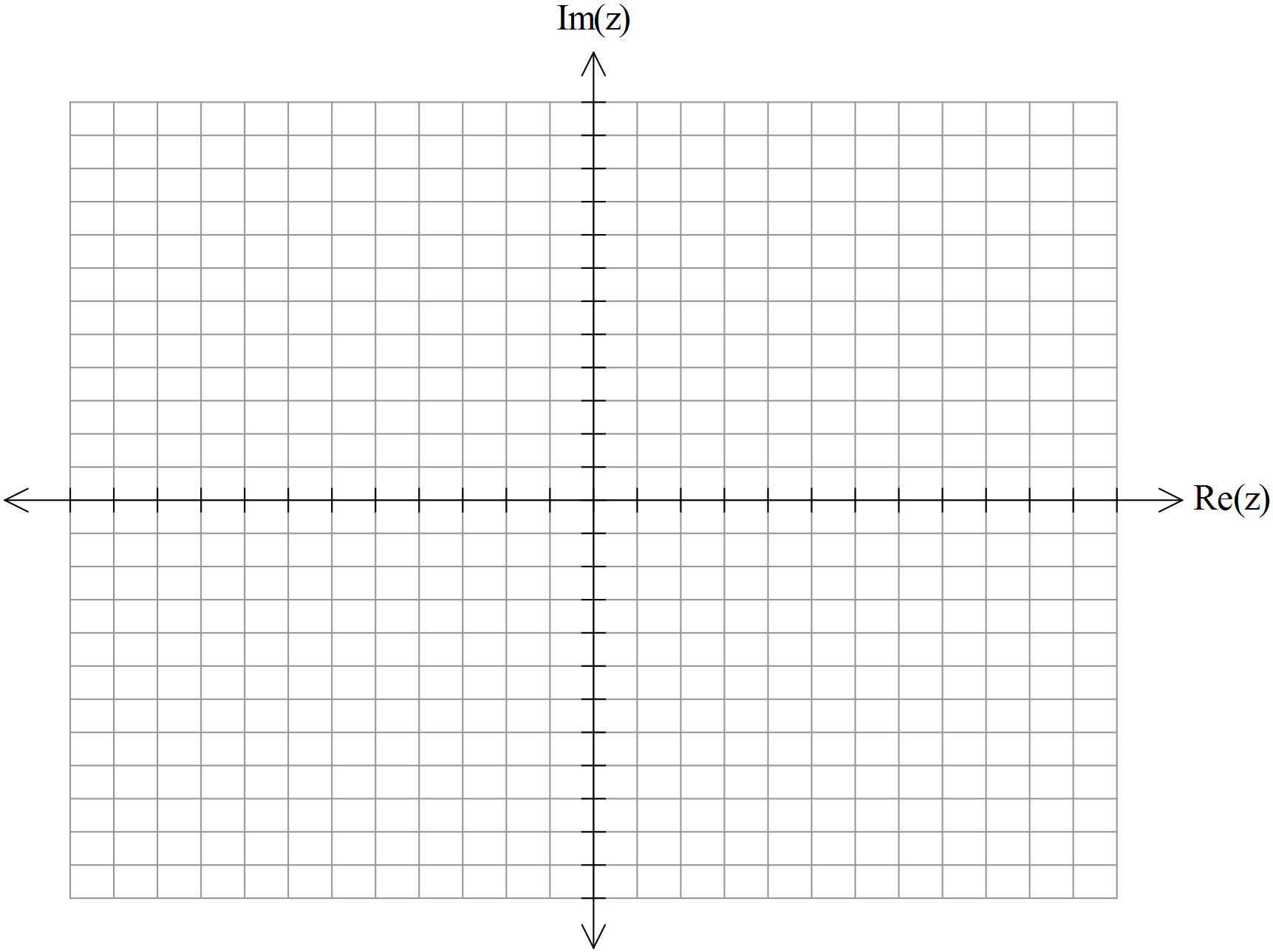
(a) If ,  and , express each of the following in the form 

(i)  (1 mark)

(ii)  (2 marks)

(iii)  . (3 marks)

(b) On the diagram below, plot ,  and . (3 marks)



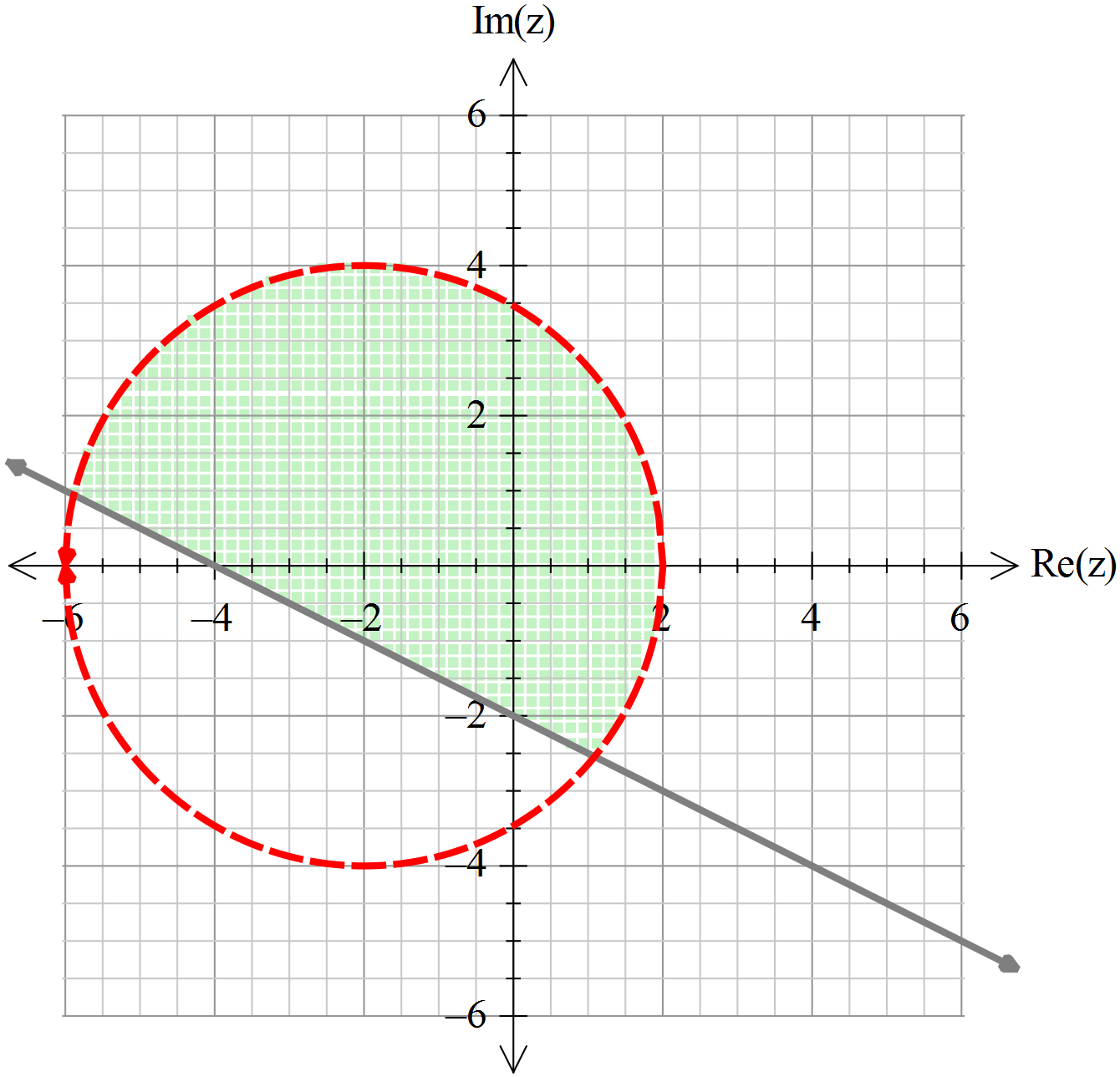
**Question 2 (9 marks)**

(a) Express  in Cartesian form. (2 marks)

(b) Use de Moivre’s theorem to determine , expressing your answer in Cartesian form.

(3 marks)

(c) State a symbolic description for the set of points indicated by the shaded region on the graph drawn below. (4 marks)



**Question 3 (12 marks)**

Functions  and  are defined as follows  and .

(a) Determine an expression for  and state its natural domain and range.

(3 marks)

(b) Determine an expression for  and state its natural domain and range.

(3 marks)

Function  is defined as .

(c) Determine the range of  over its natural domain. (2 marks)

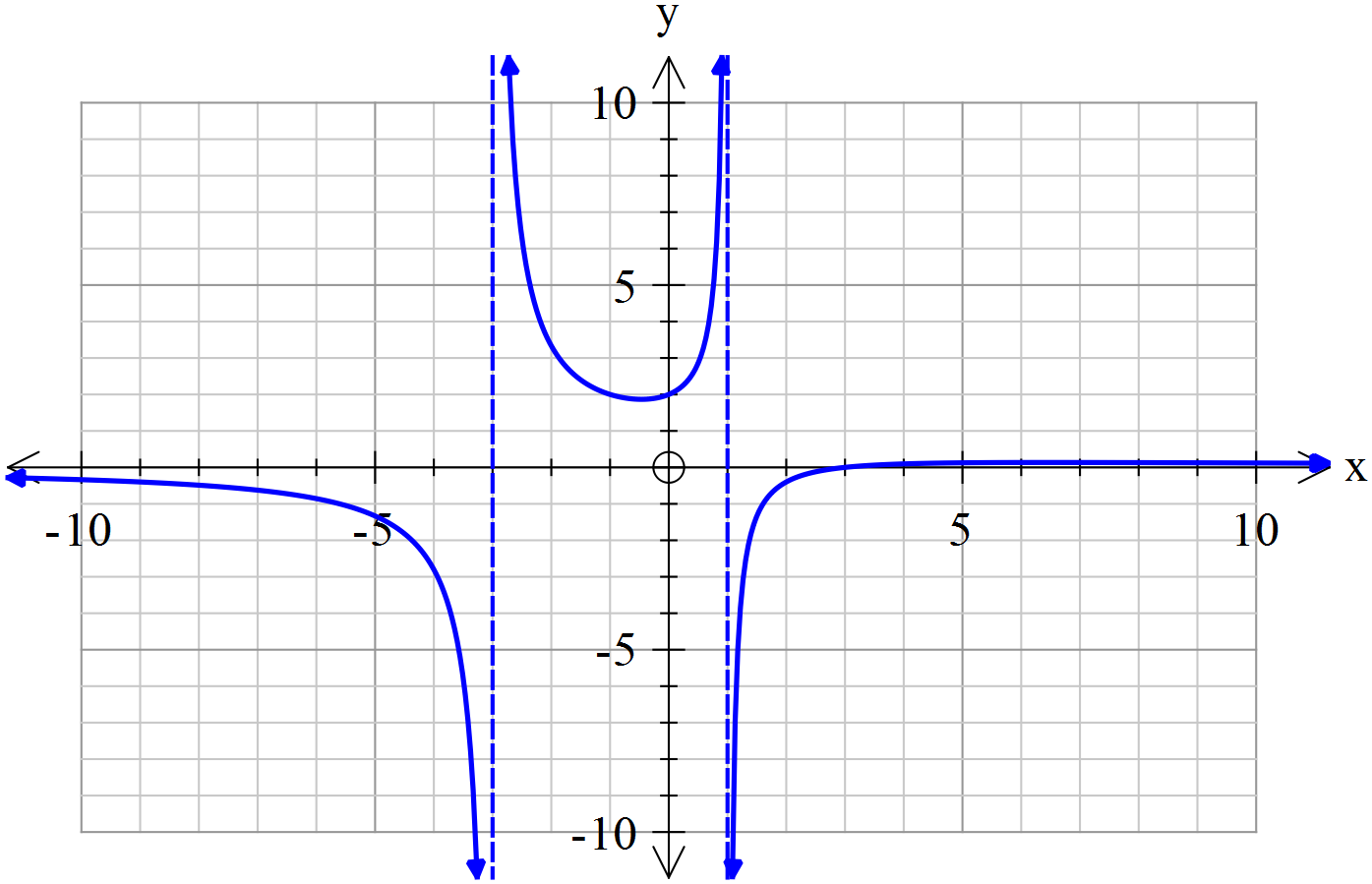
(d) The domain of  is restricted so that  is a function and this restricted domain contains . If this restricted domain represents the largest possible domain, determine the defining rule for .

(4 marks)

**Question 4 (3 marks)**

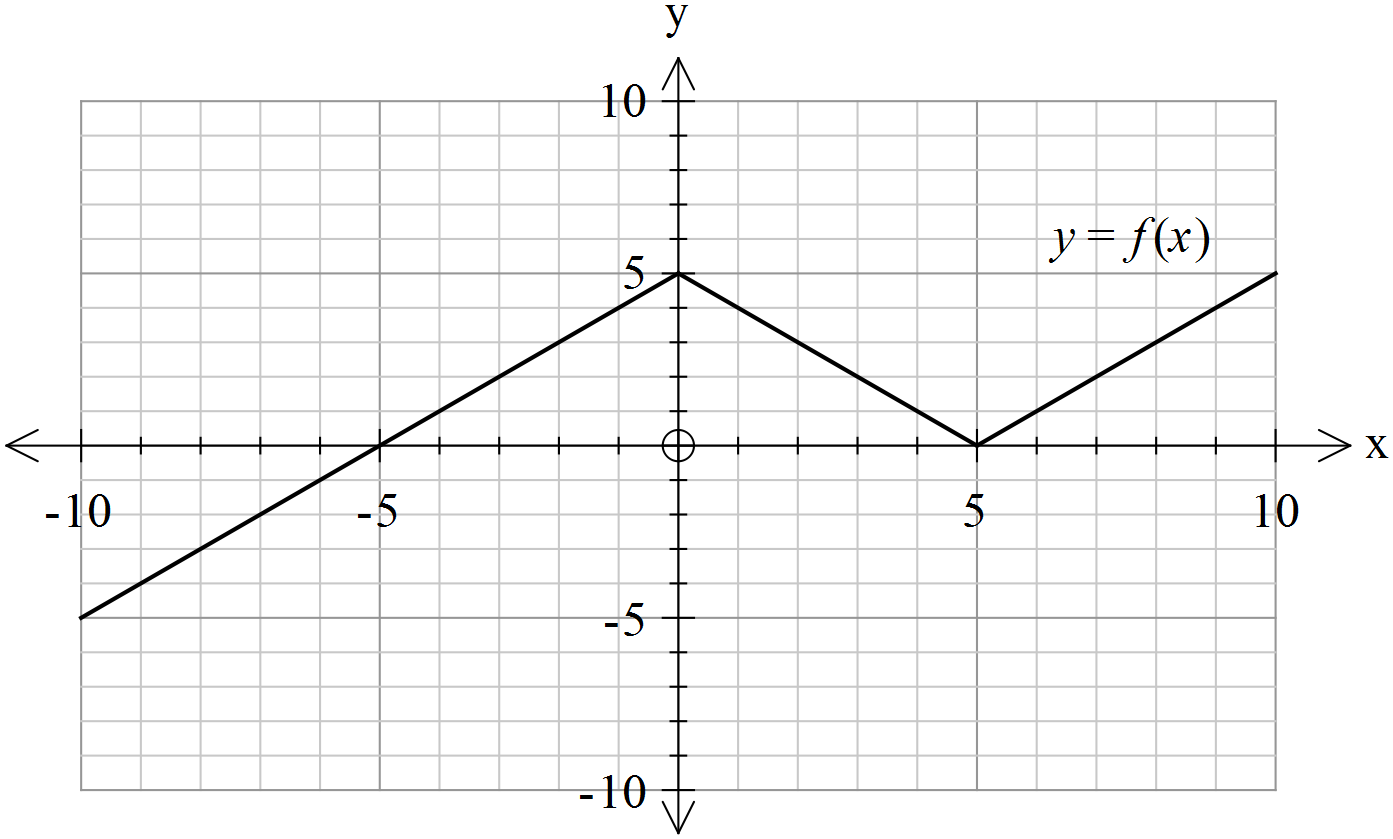
The graph of the function  is shown on the axes below, where  and  are constants.

Determine the value of the constants given that  and  are known points on this graph.



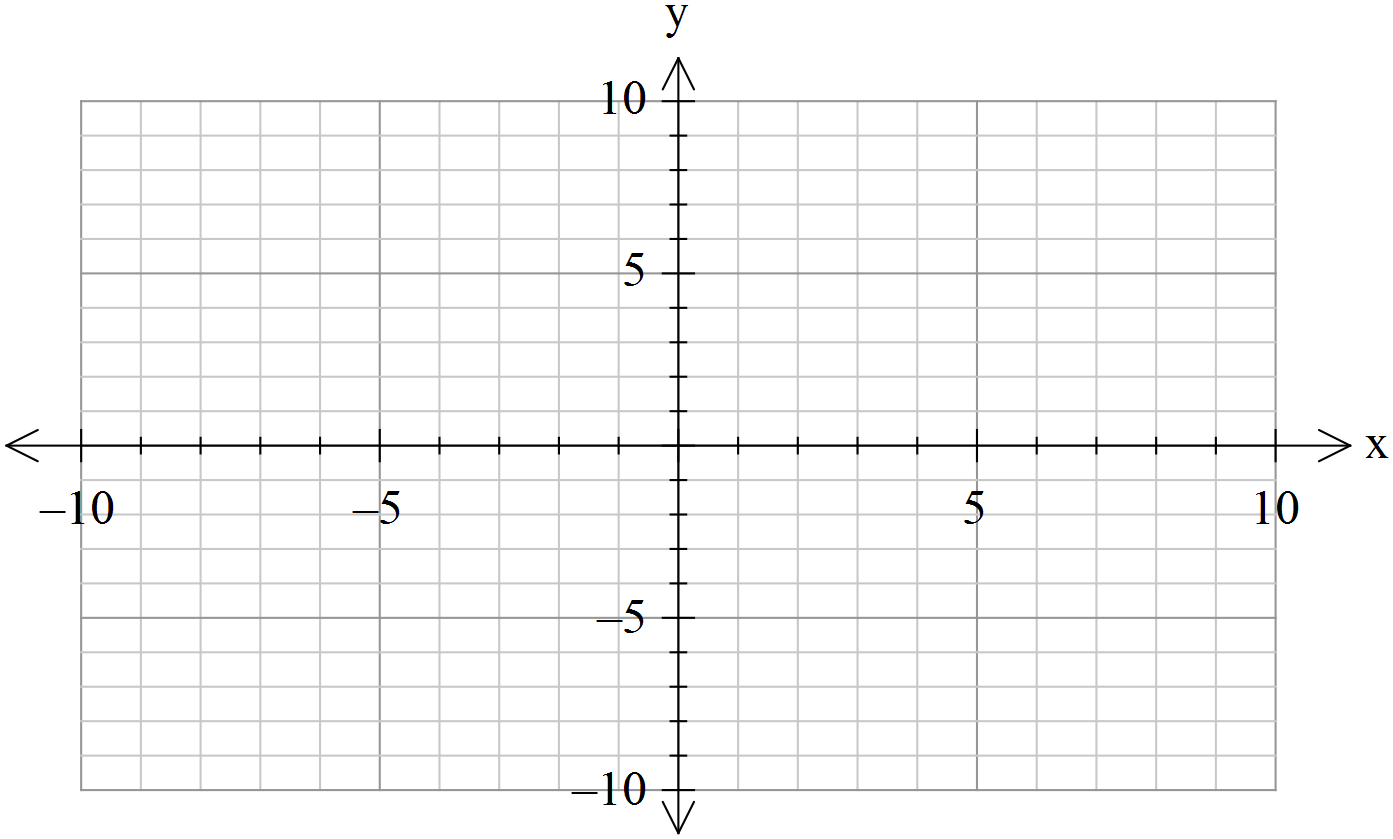
**Question 5 (8 marks)**

Consider the function  as drawn below.

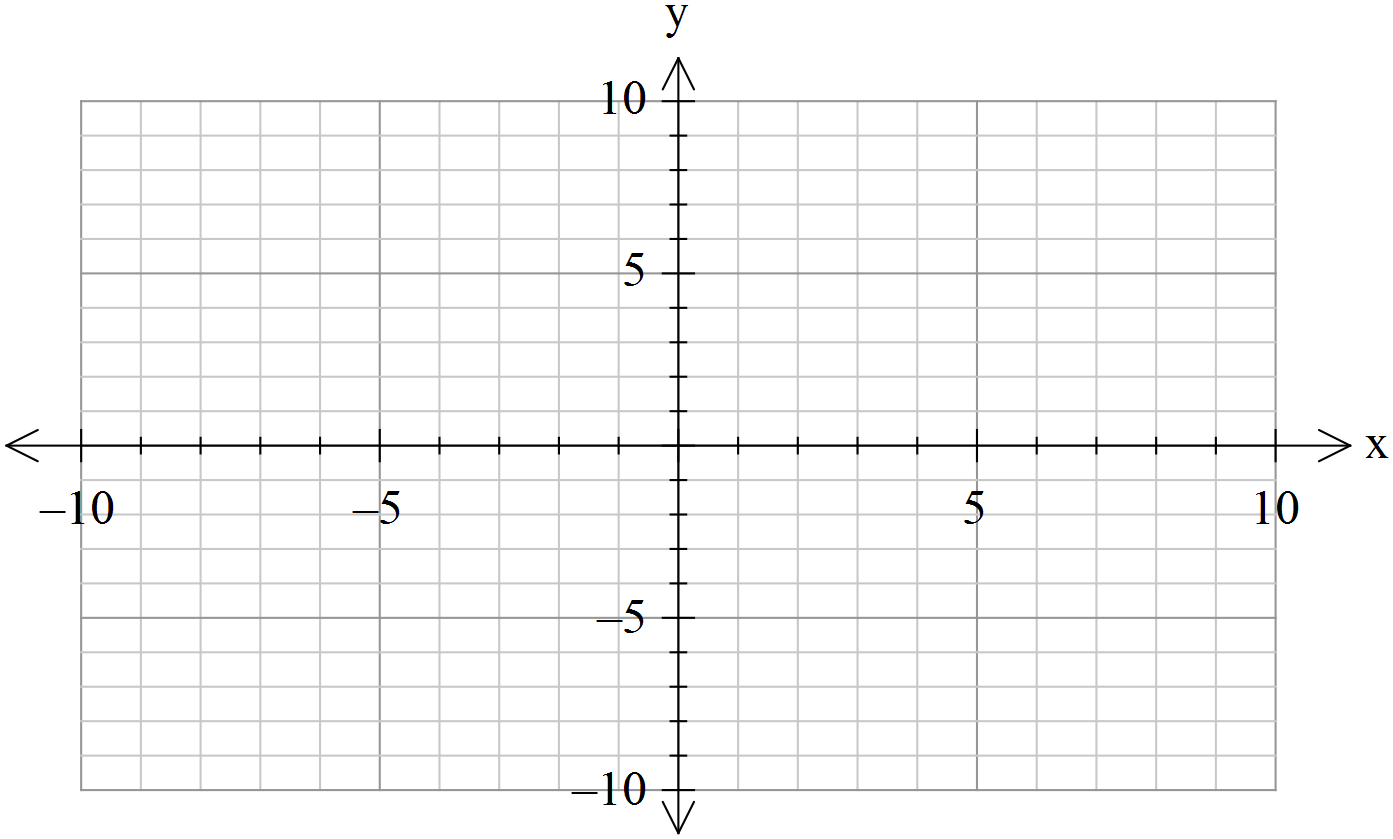


On the axes below, sketch the following:

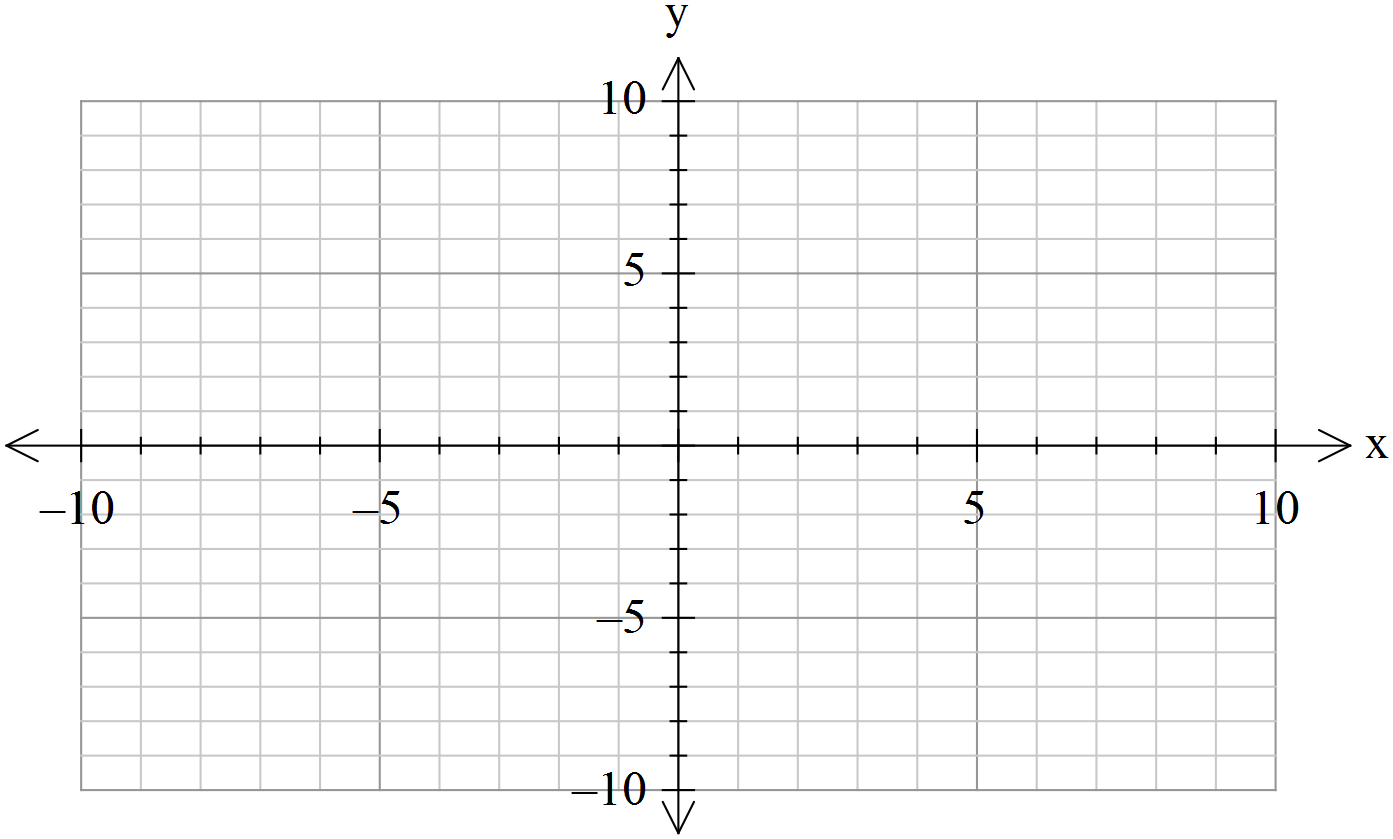
(a)  (2 marks)



(b)  (2 marks)

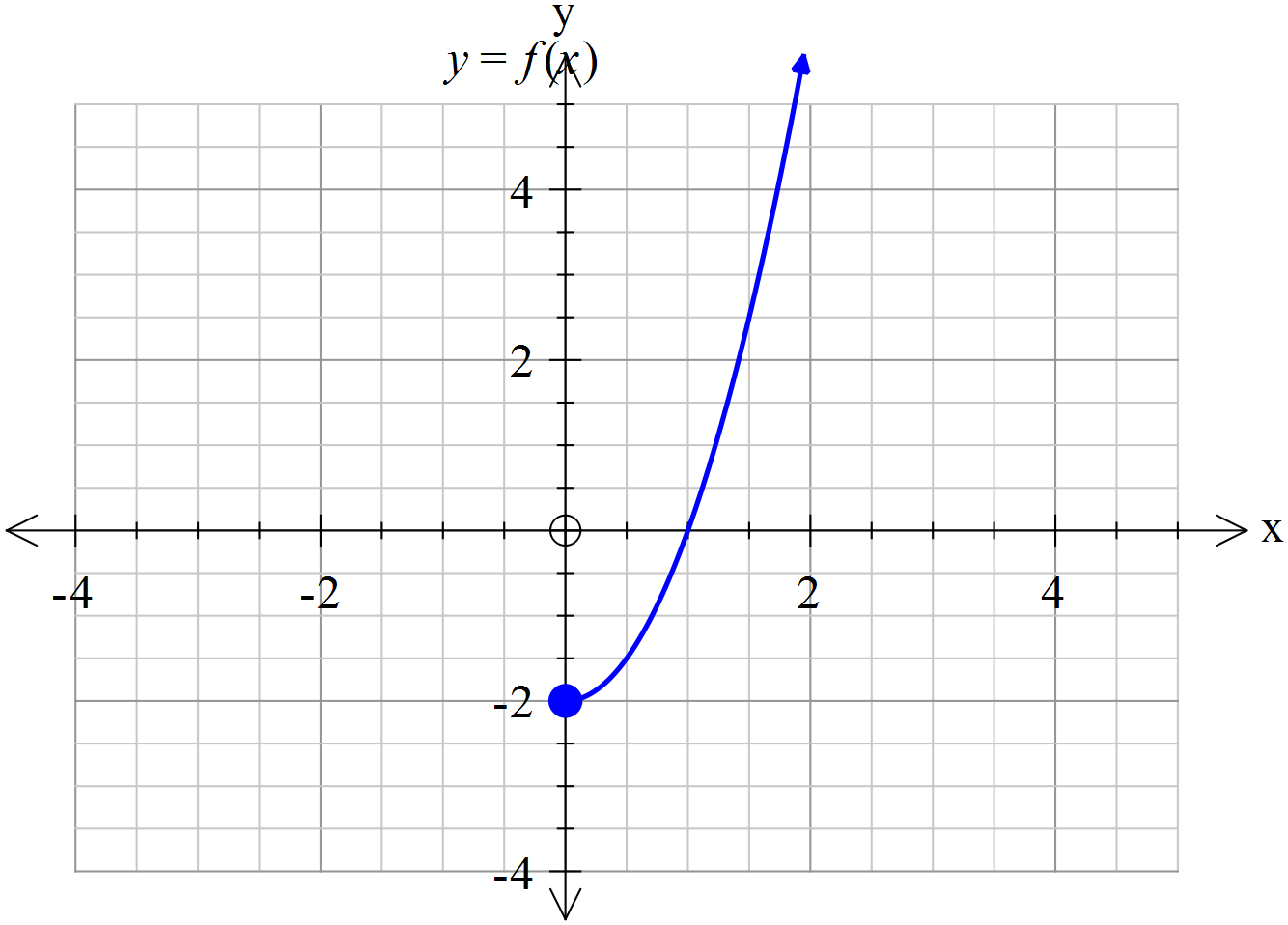


(c)  (4 marks)



**Question 6 (5 marks)**

Consider the function  with  which is drawn on the axes below.



(a) On the axes above, sketch . (3 marks)

(b) Solve . (2 marks)

**Question 7 (6 marks)**

(a) Solve the following system of linear equations: (3 marks)

(b) Consider the following system of equations: (3 marks)

For which values of the constants and are there infinitely many solutions?

Additional working space

Question number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Acknowledgements**

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