**MATHEMATICS SPECIALIST 3 & 4** Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Test 1 2018 Weighting:4%**

**Section One: Calculator-free**

Reading Time: 2 minutes

Time Allowed: 19 minutes Total Marks: 19

Question 1 (7 marks)

The function is defined by .

(a) Evaluate . (1 mark)

(b) Determine and simplify an expression for . (2 marks)

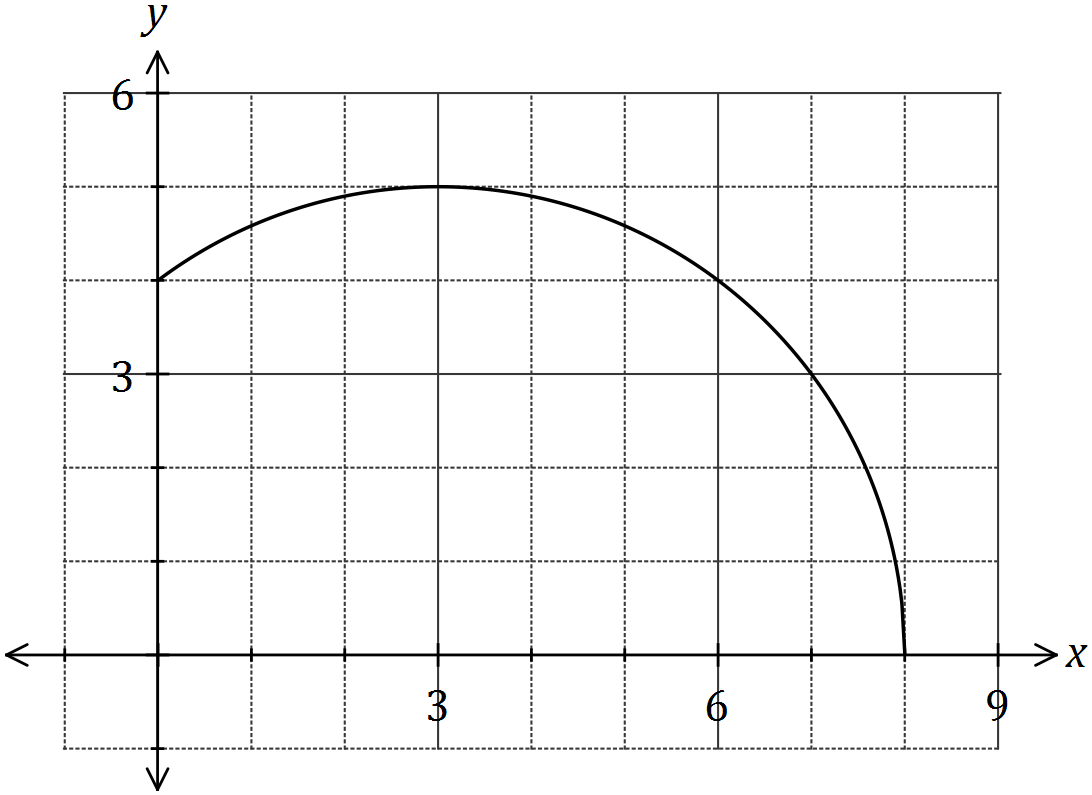
(c) For , state the

(i) domain. (2 marks)

(ii) range. (2 marks)

Question 2 (6 marks)

Let . The graph of is shown below.



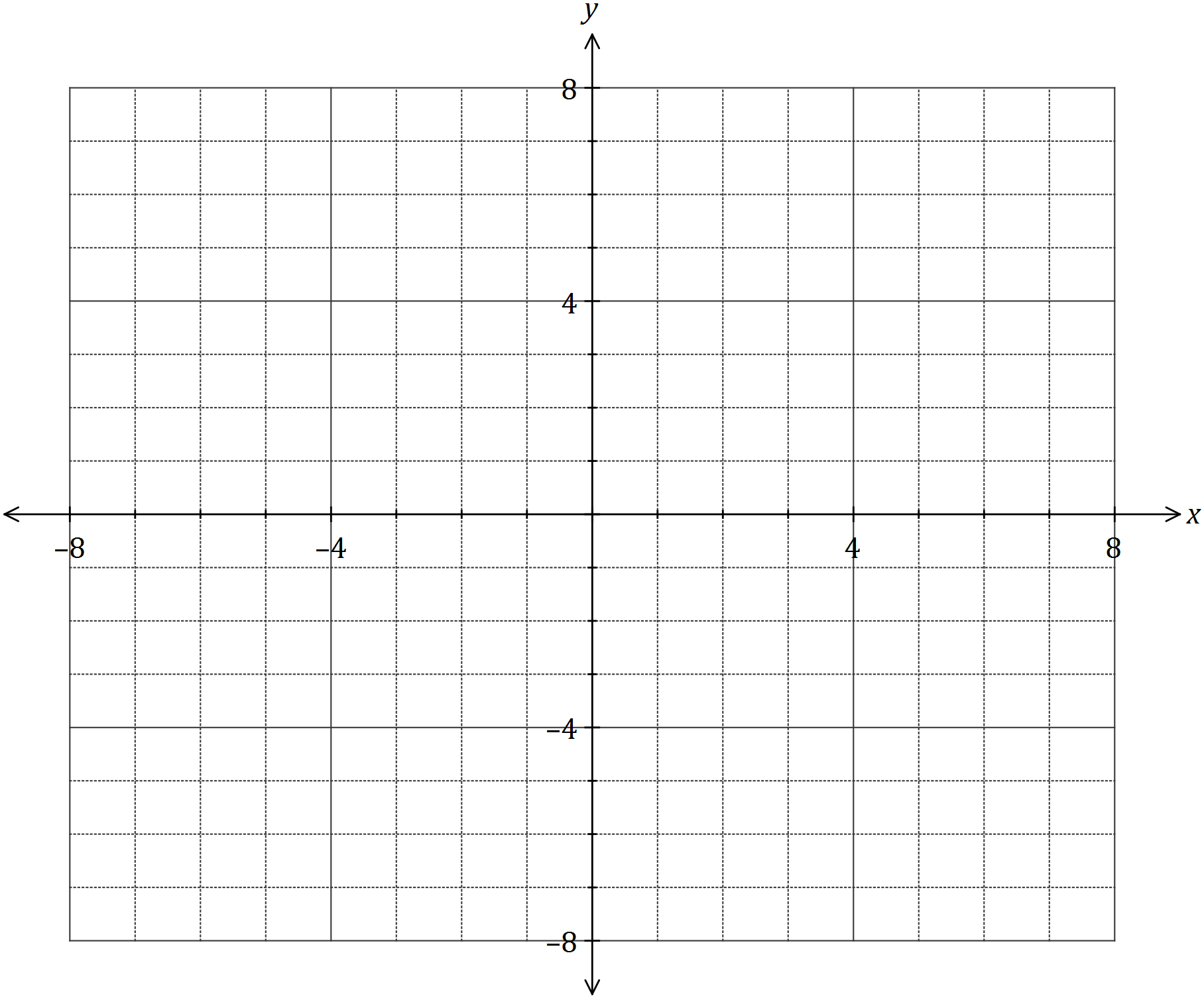
(a) In order that is a function, the domain of must be restricted to . Explain why this restriction is necessary and state the minimum value of . (2 marks)

(b) Using the restriction from (a), determine the inverse function of and its domain.

(4 marks)

Question 3 (6 marks)

On the axes below, draw the graph of , clearly showing key features and the behaviour of the curve near the asymptotes.



**MATHEMATICS SPECIALIST 3 & 4** Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Test 1 2018**

**Section Two: Calculator-assumed**

Reading Time: 3 minutes

Time Allowed: 31 minutes Total Marks: 31

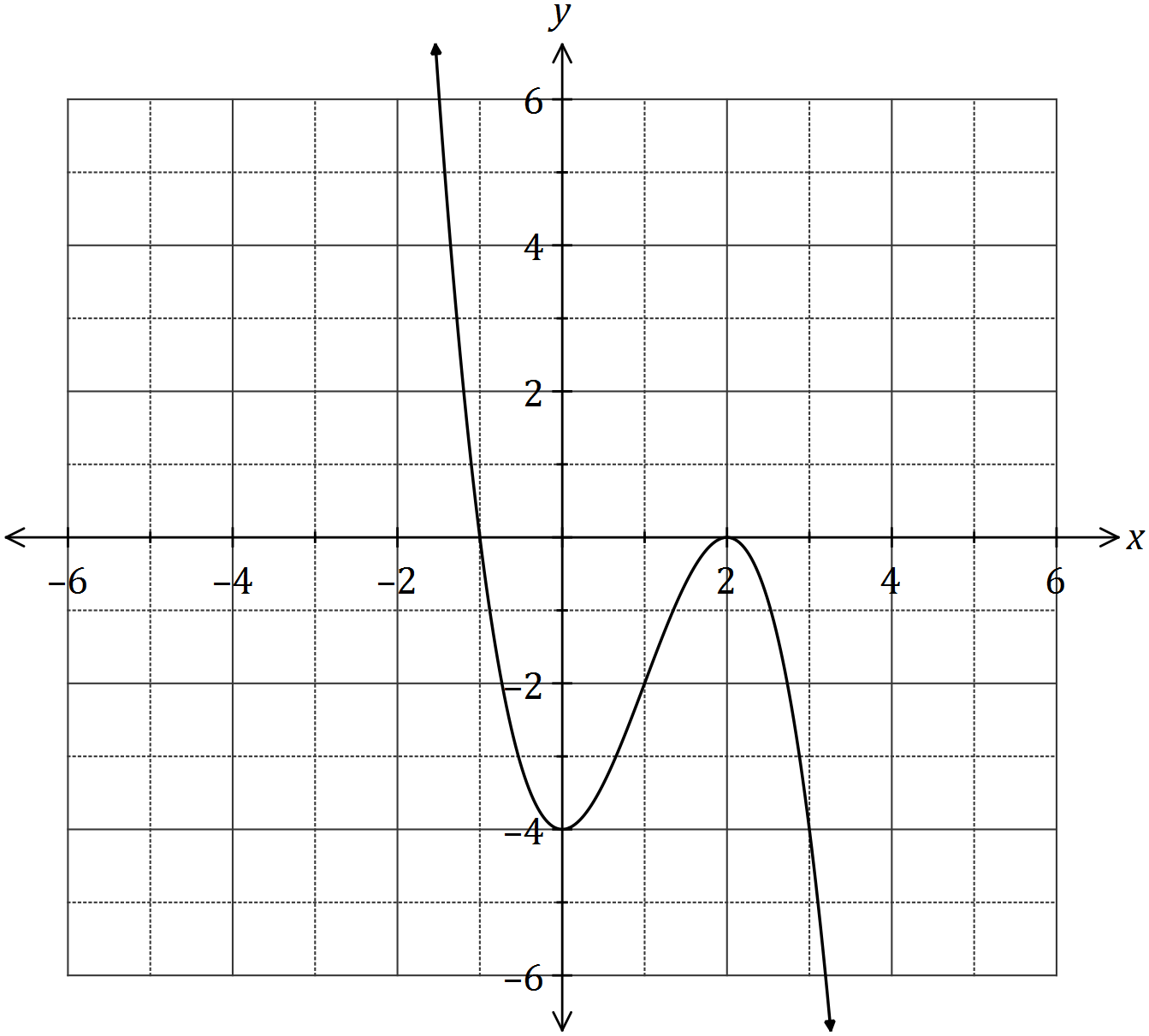
**Question 4 (5 marks)**

For each graph below that shows a function, on the same axes sketch the inverse function. For those that do not show a function, clearly indicate which graph(s) and briefly give your reasoning in the space below the graph.



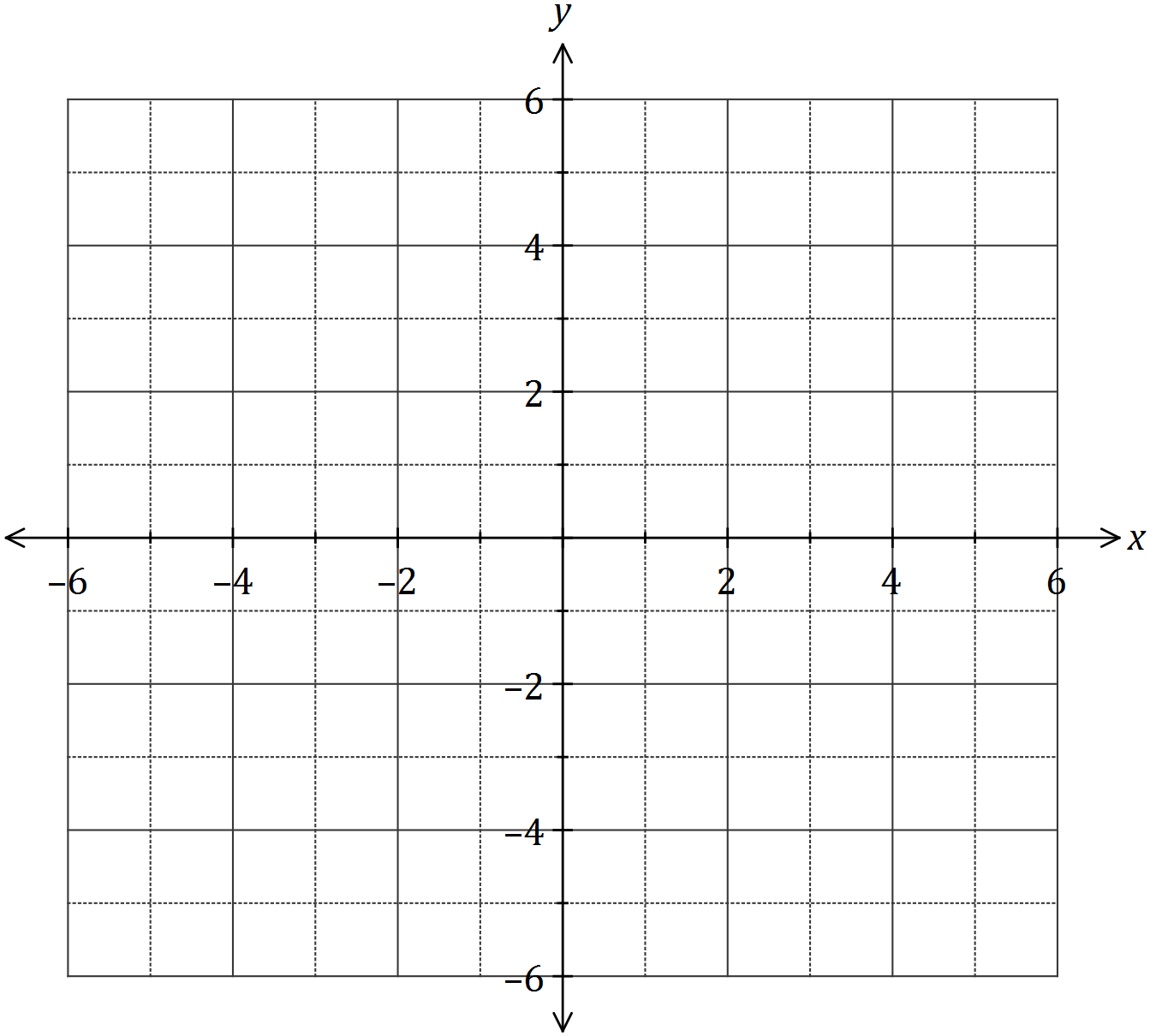
Question 5 (8 marks)

The graph of is drawn below.

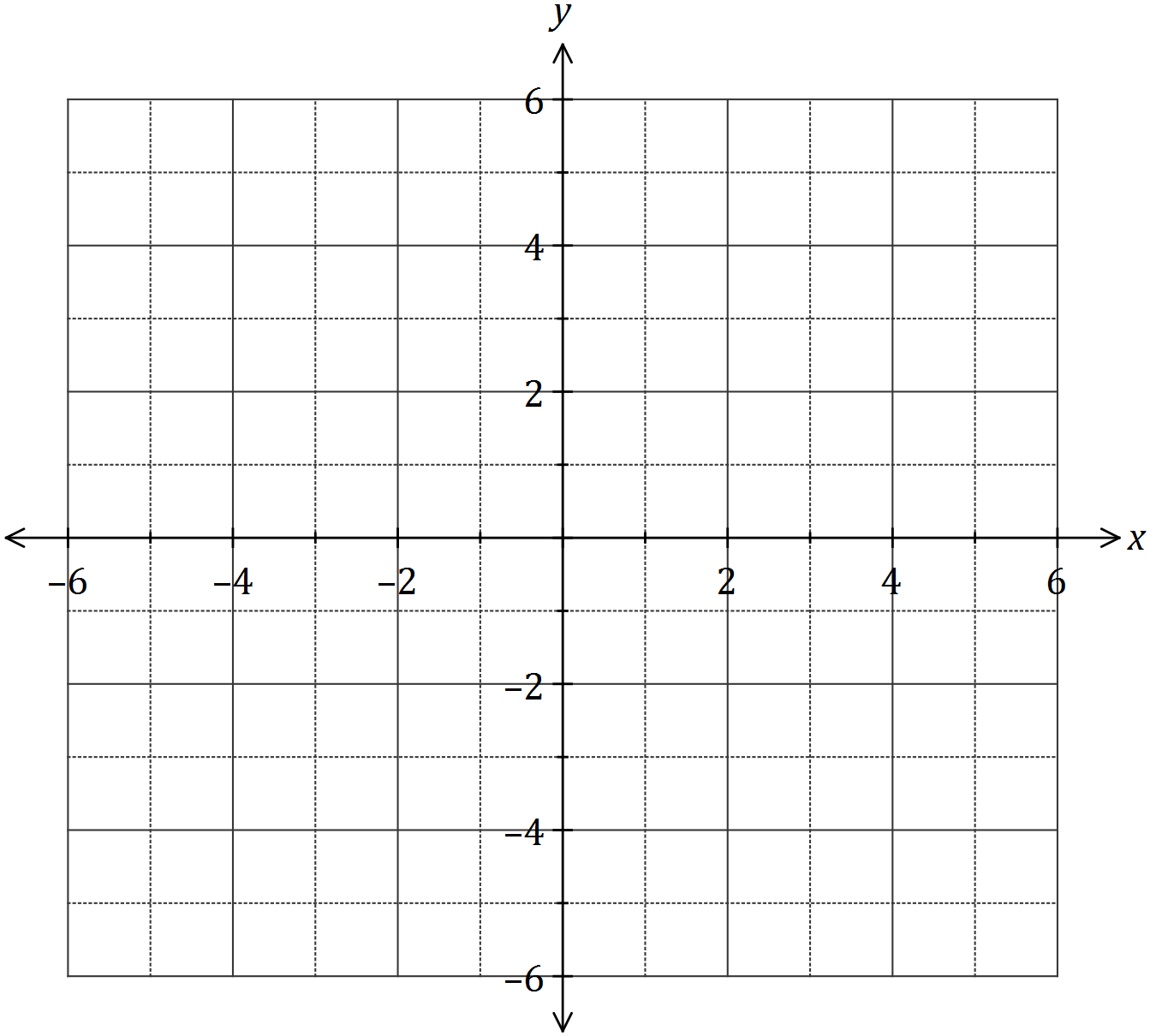


On the axes provided, sketch the graphs of

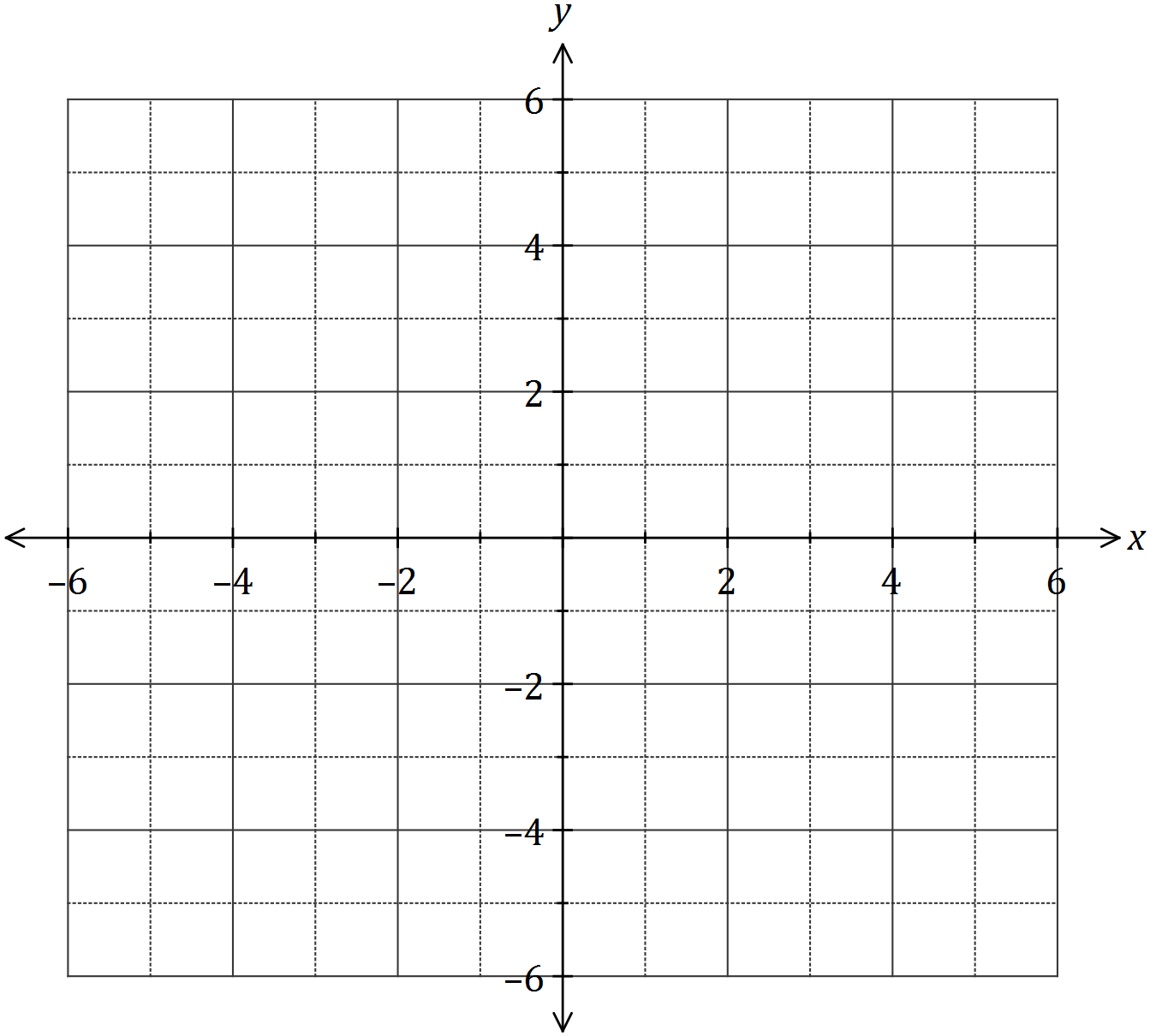
(a) . (2 marks)



(b) . (2 marks)

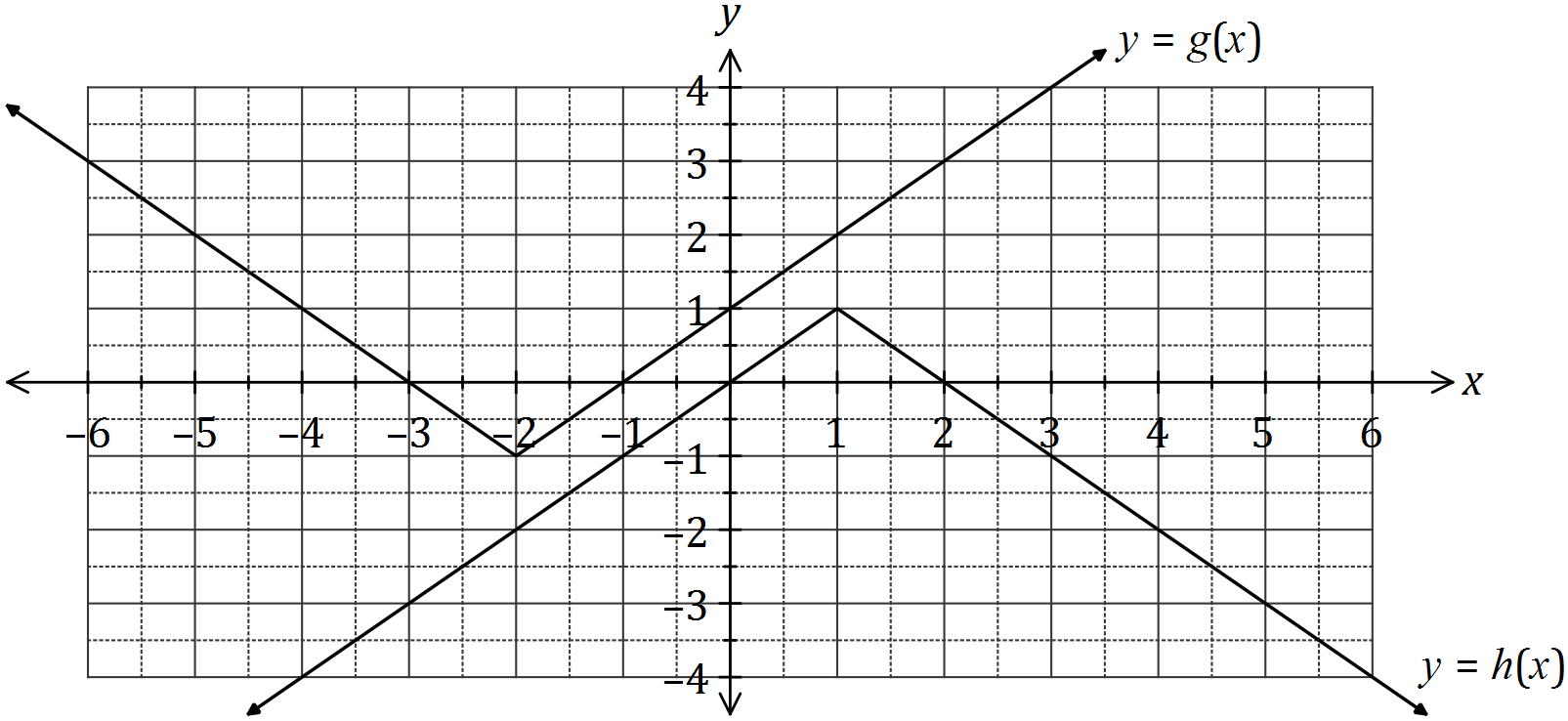


(c) . (4 marks)



Question 6 (9 marks)

(a) The graphs of the functions and are shown below.

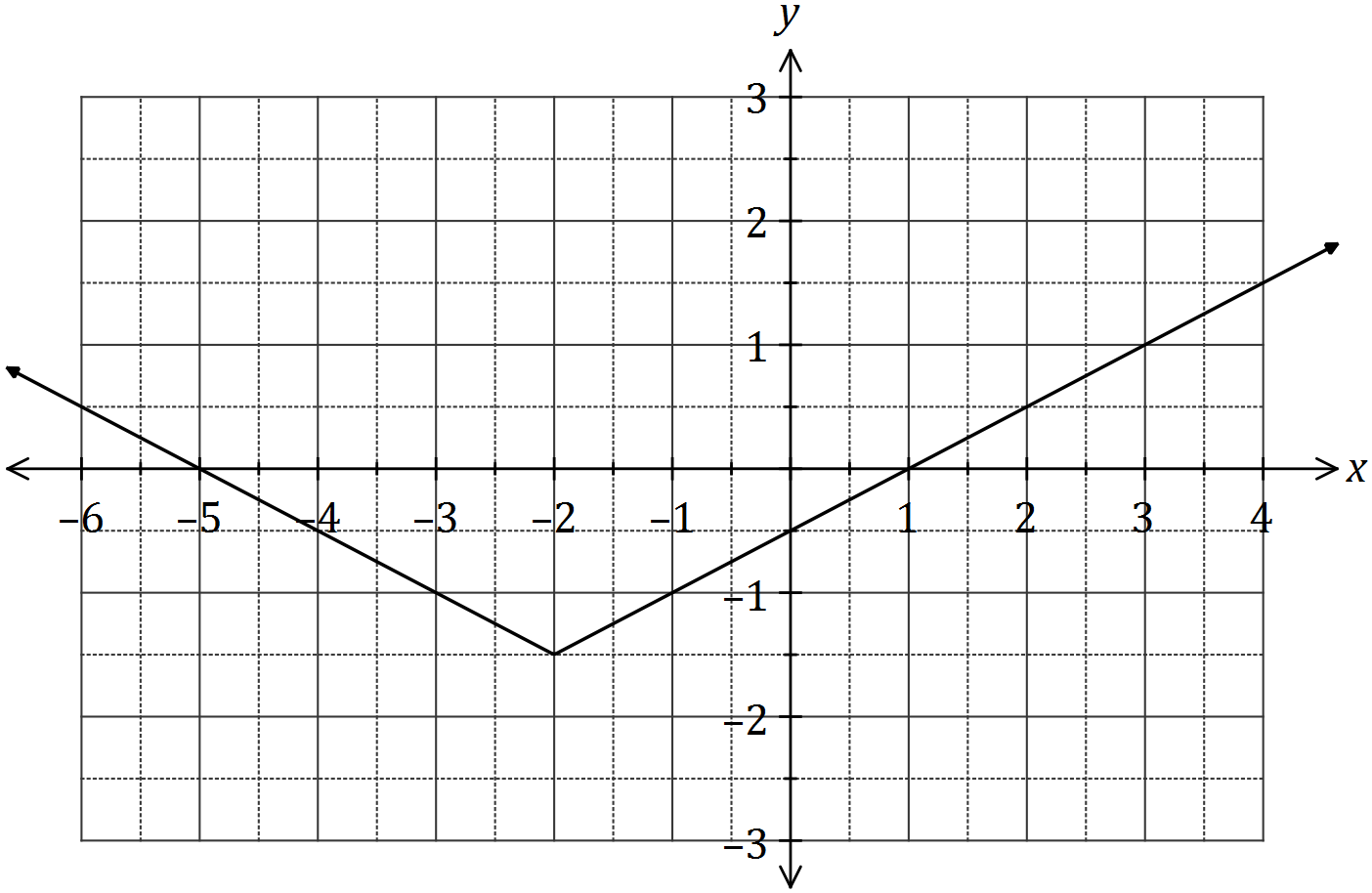


Determine the value(s) of if

(i) . (1 mark)

(ii) . (2 marks)

(b) The graph of is shown below.



(i) Determine the value of the constants , and . (3 marks)

(ii) If the equation has an infinite number of solutions, determine the values of the positive constants and . (3 marks)

Question 7 (9 marks)

A function is defined by , .

(a) Determine the exact coordinates of all stationary points of the graph of .

(2 marks)

(b) Determine the equation(s) of the asymptote(s) of the graph . (3 marks)

(c) Sketch the graph on the axes below. (4 marks)

