Mathematics Specialist Unit 3

Test 2: Polynomials and Functions

**Student Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Time allowed for this task:** 55 minutes, in class, under test conditions

Section One – calculator-free section 22 minutes (21 marks)

Section Two – calculator-assumed section 33 minutes (32 marks)

**Materials required:** Calculator with CAS capability (to be provided by the student)

Standard items: Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlights

Special items: Drawing instruments, templates, and up to three calculators approved for use in WACE examinations.

One page of A4 notes, written on both sides.

Mathematics Specialist formulae sheet.

**Marks available:** 53 marks

**Task weighting: 7%**

**Section One – calculator-free section**

**No calculators or notes are to be used.**

**Access to approved Mathematics Specialist formulae sheet is permitted.**

Simplify answers where possible.

**Question 1. (4 marks)**

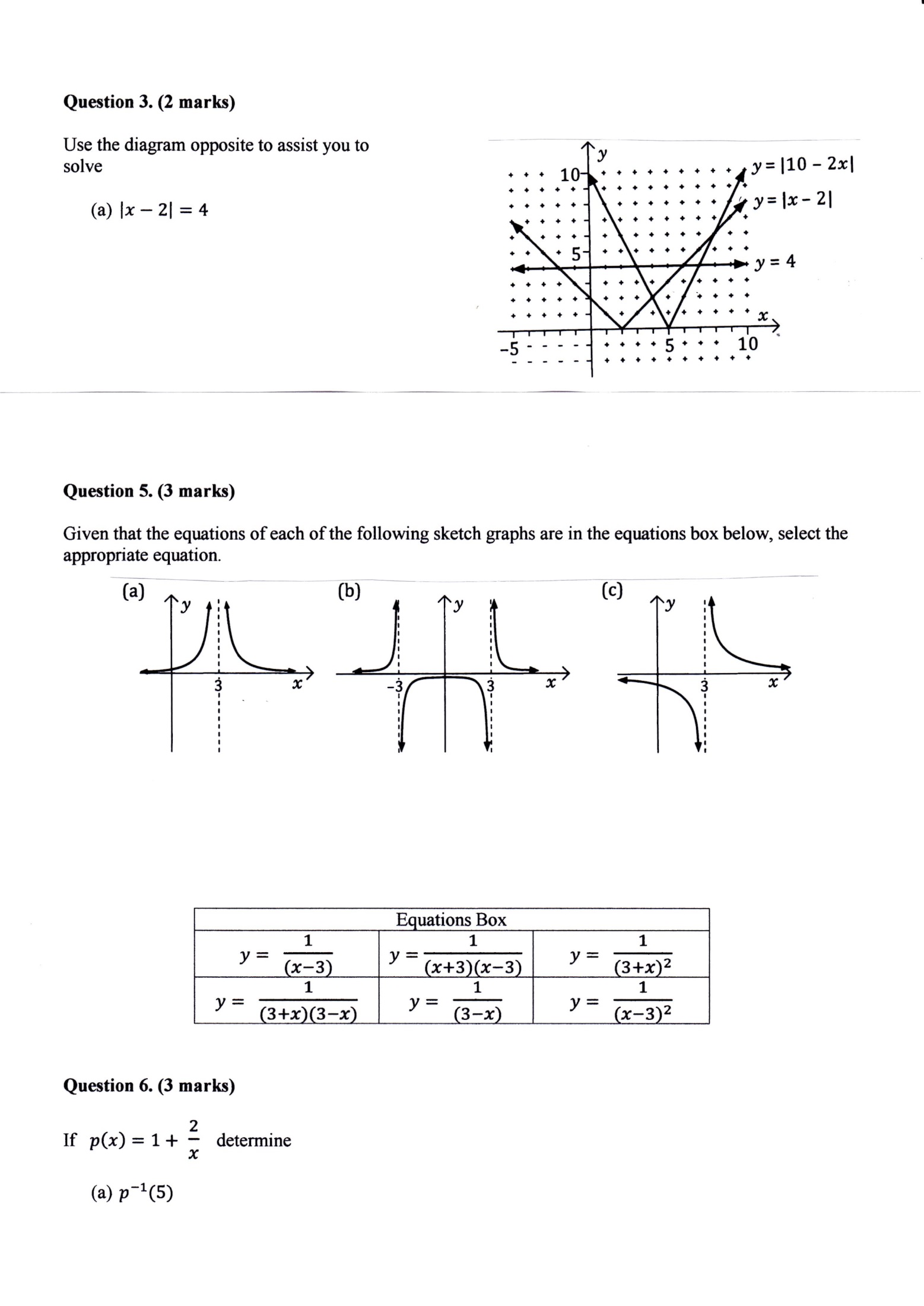
If and find the natural domain and corresponding range for

1. fog(x) (2)
2. gof(x) (2)

**Question 2. (4 marks)**

Find an expression for the inverse function of where and state the domain and range of .

**Question 3. (2 marks)**

Use the diagram opposite to assist you to solve:

**Question 4. (4 marks)**

Consider the nature of the graph of . Describe the effect on the y values of the

graph as

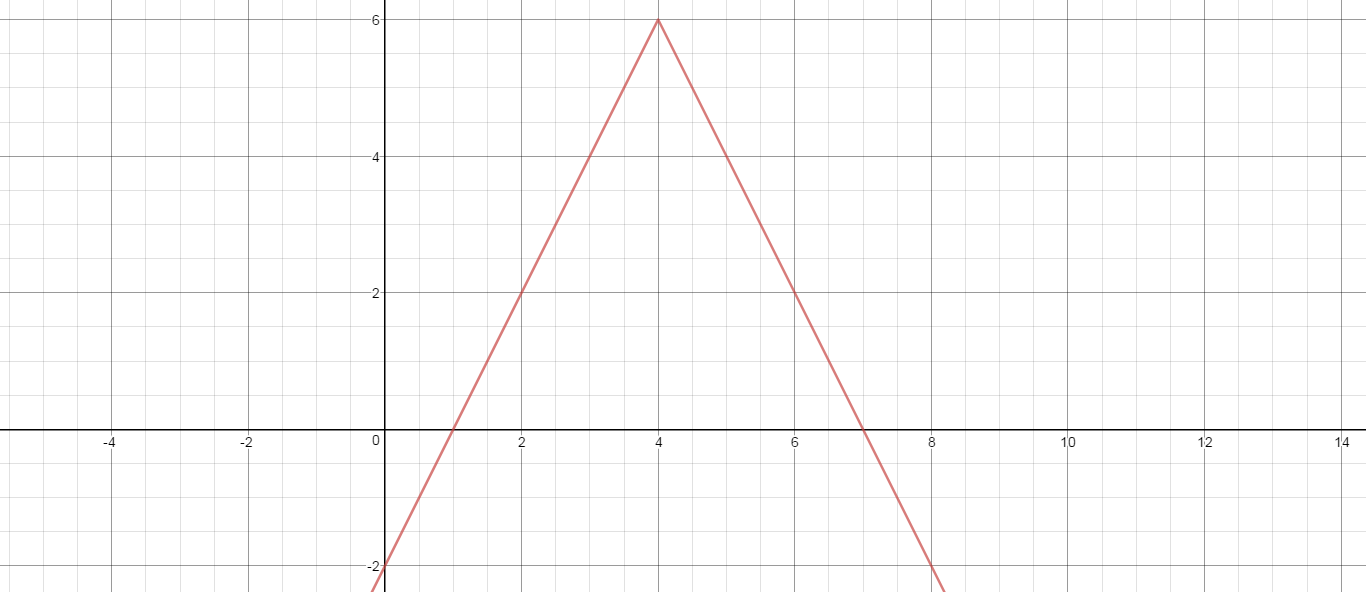
1. x tends to
2. x tends to
3. x tends to
4. x tends to

**Question 5. (3 marks)**

The graph of is shown below. Find and such that the solution to the equation

is .

*y*



*x*

**Question 6. (4 marks)**

If determine

1. (2)
2. The value(s) of x such that . (2)

**End of Section One**

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You may use this space to extend your working on a particular question or questions. Remember to number each extension.

**Do not turn over the page until so directed.**

**Section Two – calculator-assumed section**

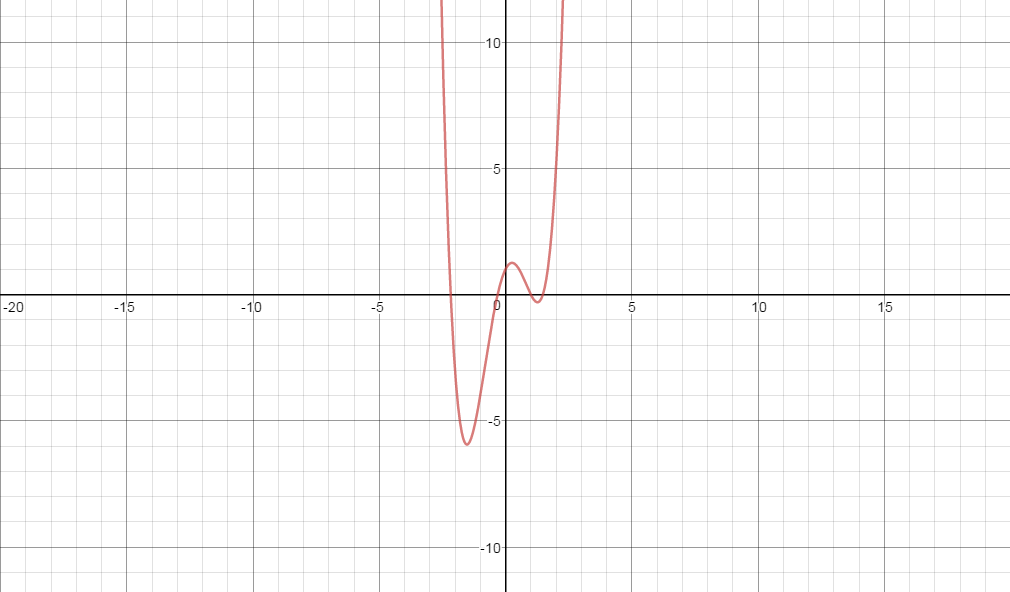
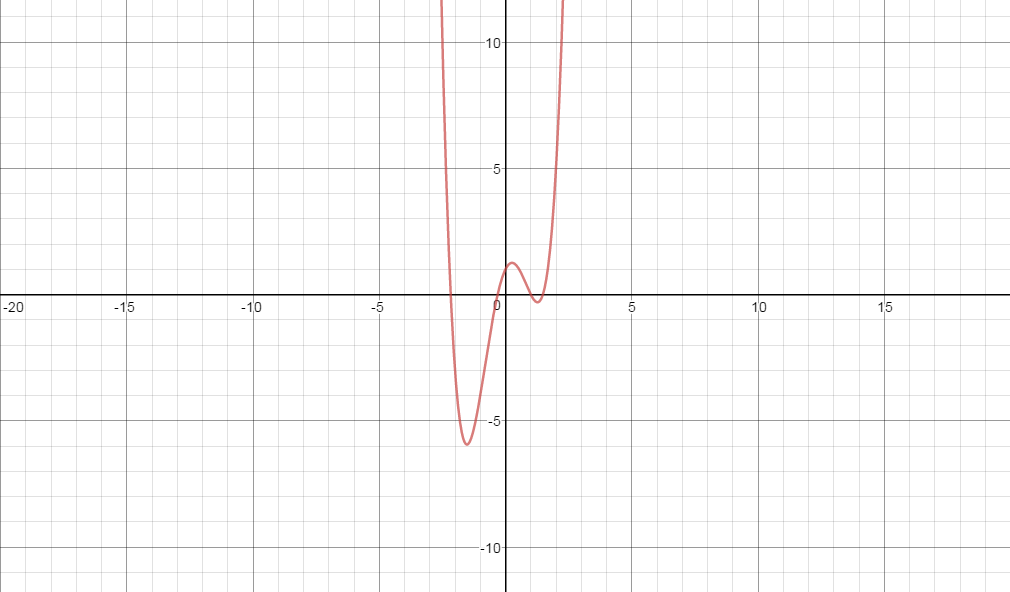
**Calculators and 1 page of A4 notes, written on both sides, allowed.**

**Access to approved Mathematics Specialist formulae sheet is permitted.**

**Question 7. (4 marks)**

The graph of is shown twice below. In diagram (a) show the graph of while in diagram (b) show the graph of.

(a) *y* (b) *y*

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*x x*

**Question 8. (3 marks)**

Find an expression for the inverse function of where and state its

domain and range.

**Question 9. (4 marks)**

Given that and state the natural domain and the corresponding

range of each of the following functions:

1. (2)
2. (2)

**Question 10. (6 marks)**

Determine all of the asymptotes for each of the following functions:

1. T(x) = (2)
2. U(x) = (2)
3. V(x) = (2)

**Question 11. (4 marks)**

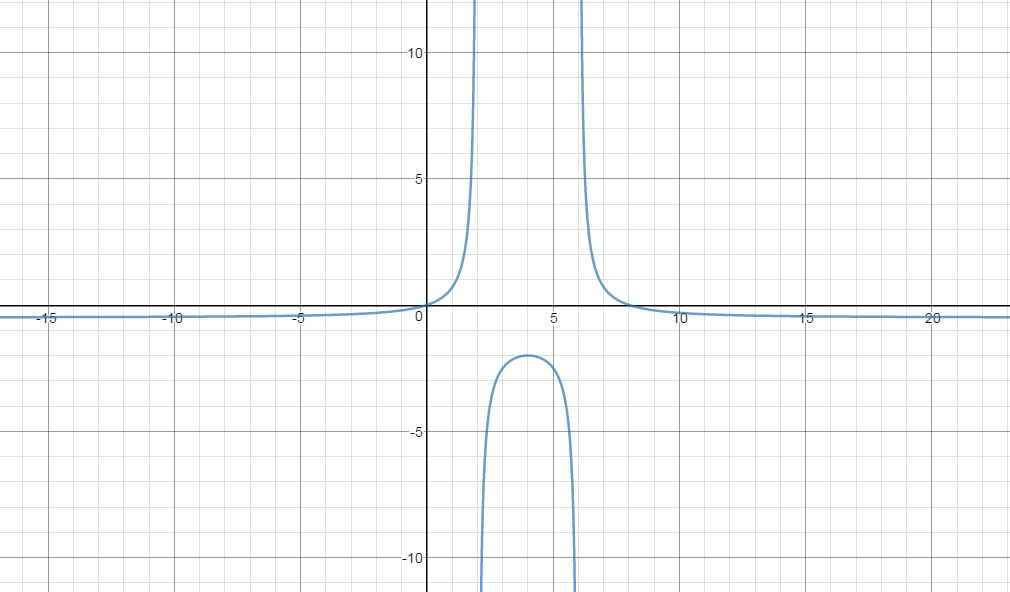
Consider the graph of .

1. Locate any asymptotes. (2)
2. Describe any other discontinuities. (2)

**Question 12. (5 marks)**

The graph of is shown below. It has asymptotes at . On the same set of axes draw the graph of , clearly showing any roots and asymptotes.

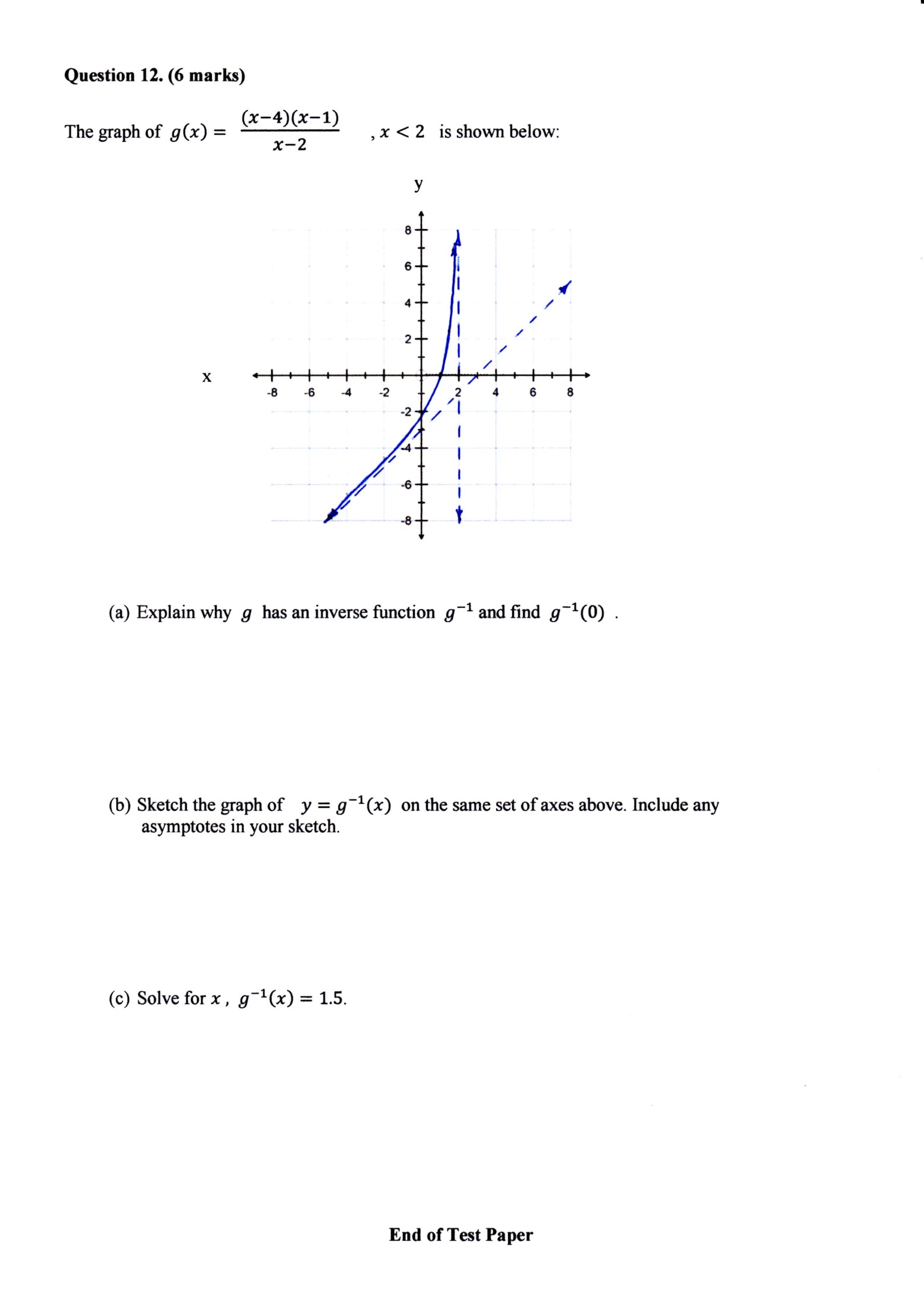
*y*



*x*

**Question 13. (6 marks)**

The graph of , is shown below:



1. Explain why has an inverse function and find . (2)
2. Sketch the graph of on the same set of axes above. Include any

asymptotes in your sketch. (2)

1. Solve for . (2)

**End of Test Paper**

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You may use this space to extend your working on a particular question or questions. Remember to number each extension.