Mathematics Specialist Unit 3

Test 2: Polynomials and Functions

**Solutions**

**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, highlighters.

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**

**Question 1. (4 marks)**

If and find the natural domain and corresponding range for

1. fog(x) = + 1 (2)

**✓**

**✓**

1. gof(x) = (2)

**✓**

**✓**

**Question 2. (4 marks)**

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

,

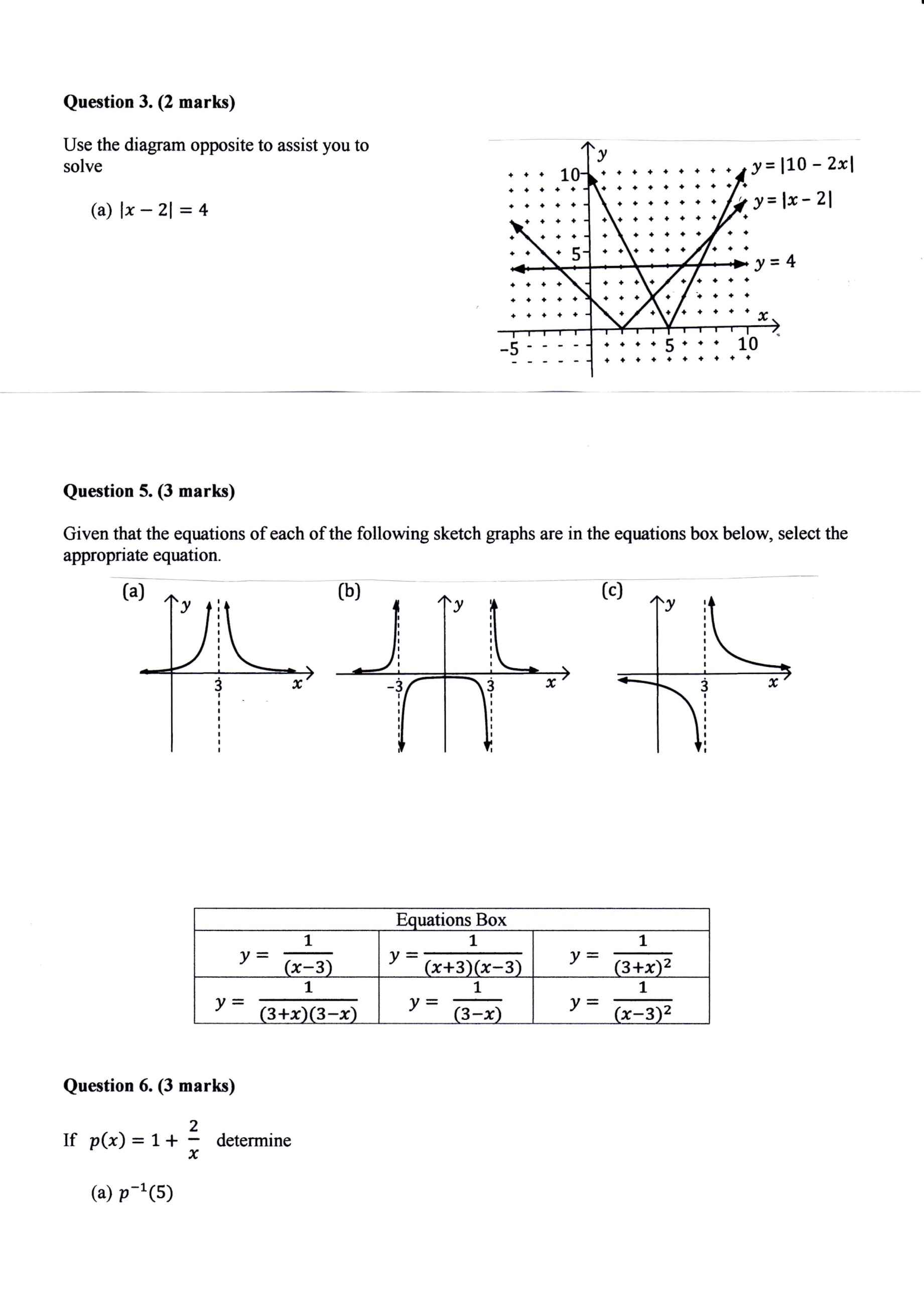
invert *3+y =*

**✓✓**

**✓**

**✓**

**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

=

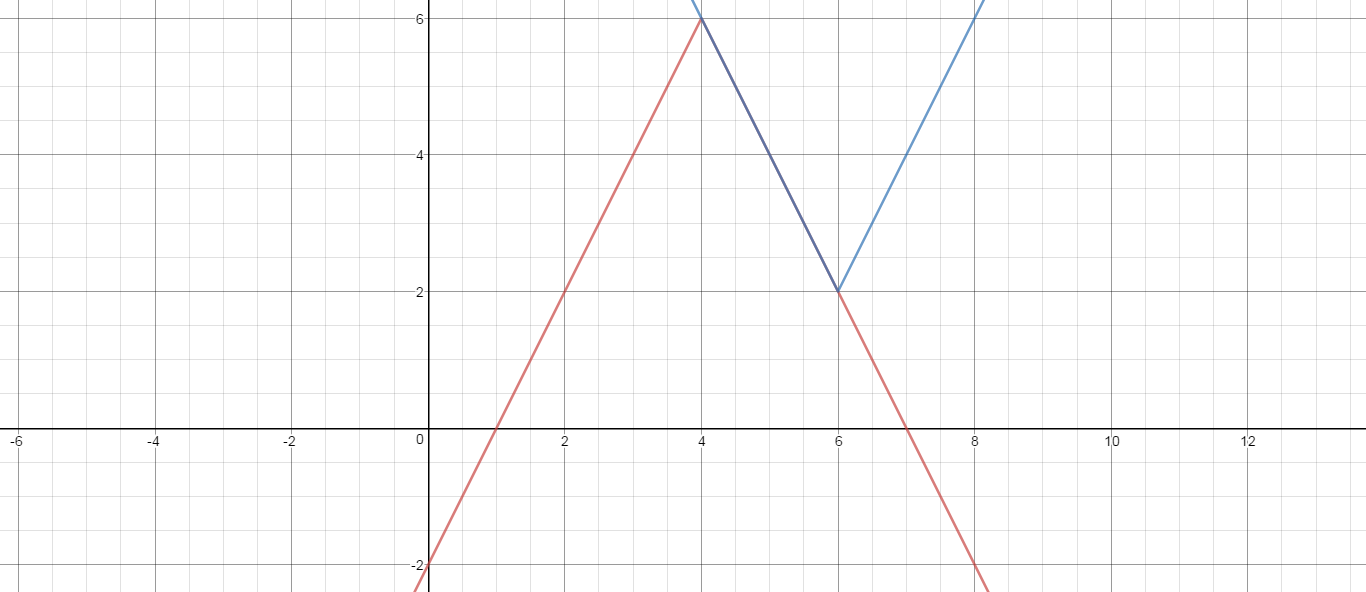
1. x tends to  **✓**
2. x tends to  **✓**
3. x tends to  **✓** = open point ()
4. x tends to  **✓** = 0 at

**Question 5. (3 marks)**

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

is .

*y*



*x*

Gradient 2 and vertex at **✓✓✓**

**Question 6. (4 marks)**

If determine

1. Put **✓** (2)

, 5)

**✓**

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

**✓**

**✓**

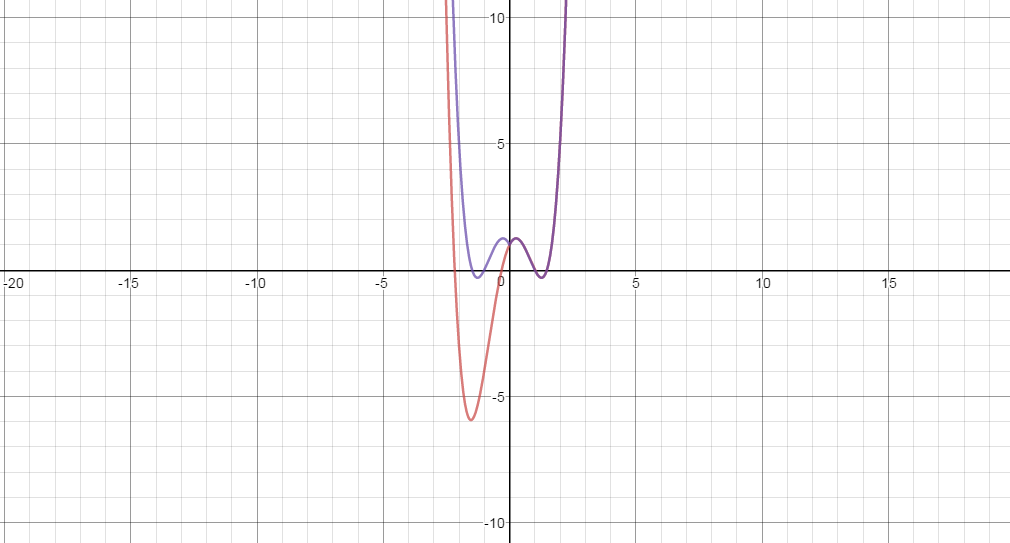
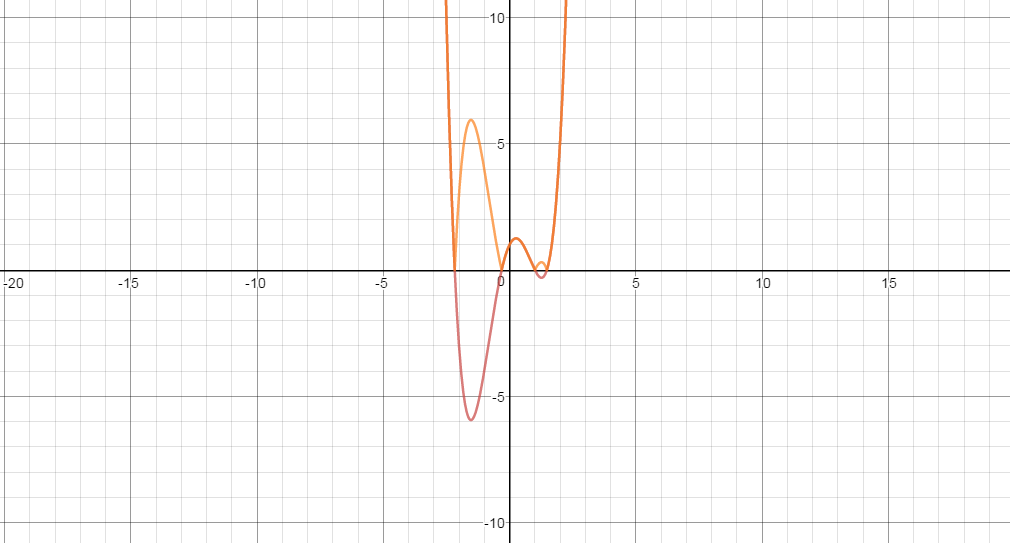
**End of Section One**

**Section Two – calculator-assumed section**

**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*



*x x*

**✓✓ ✓✓**

**Question 8. (3 marks)**

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

domain and range.

**✓** Use solve ( on classpad

**✓**

**✓**

**Question 9. (4 marks)**

Given that and state the natural domain and the corresponding

range of each of the following functions:

1. = (2)

**✓**

**✓**

1. = (2)

**✓**

**✓**

**Question 10. (6 marks)**

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

1. T(x) = **vertical asymptote at ✓** (2)

**oblique asymptote at ✓**

1. U(x) = , x (2)

**vertical asymptote at ✓** open point at (

**horizontal asymptote at ✓**

1. V(x) = (2)

**vertical asymptotes at ✓**

**horizontal asymptote at ✓**

**Question 11. (4 marks)**

Consider the graph of

1. Locate any asymptotes. (2)

**vertical asymptotes at ✓**

**horizontal asymptote at ✓**

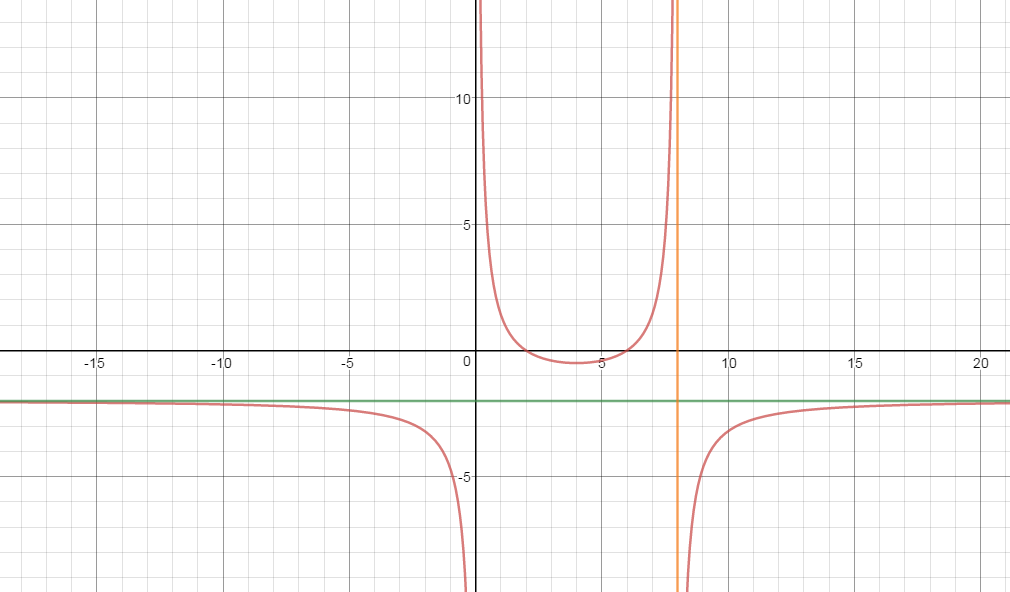
1. Describe any other discontinuities. (2)

**✓**

**An open point at ✓**

**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.



Roots at **✓**

Asymptotes at and **✓**

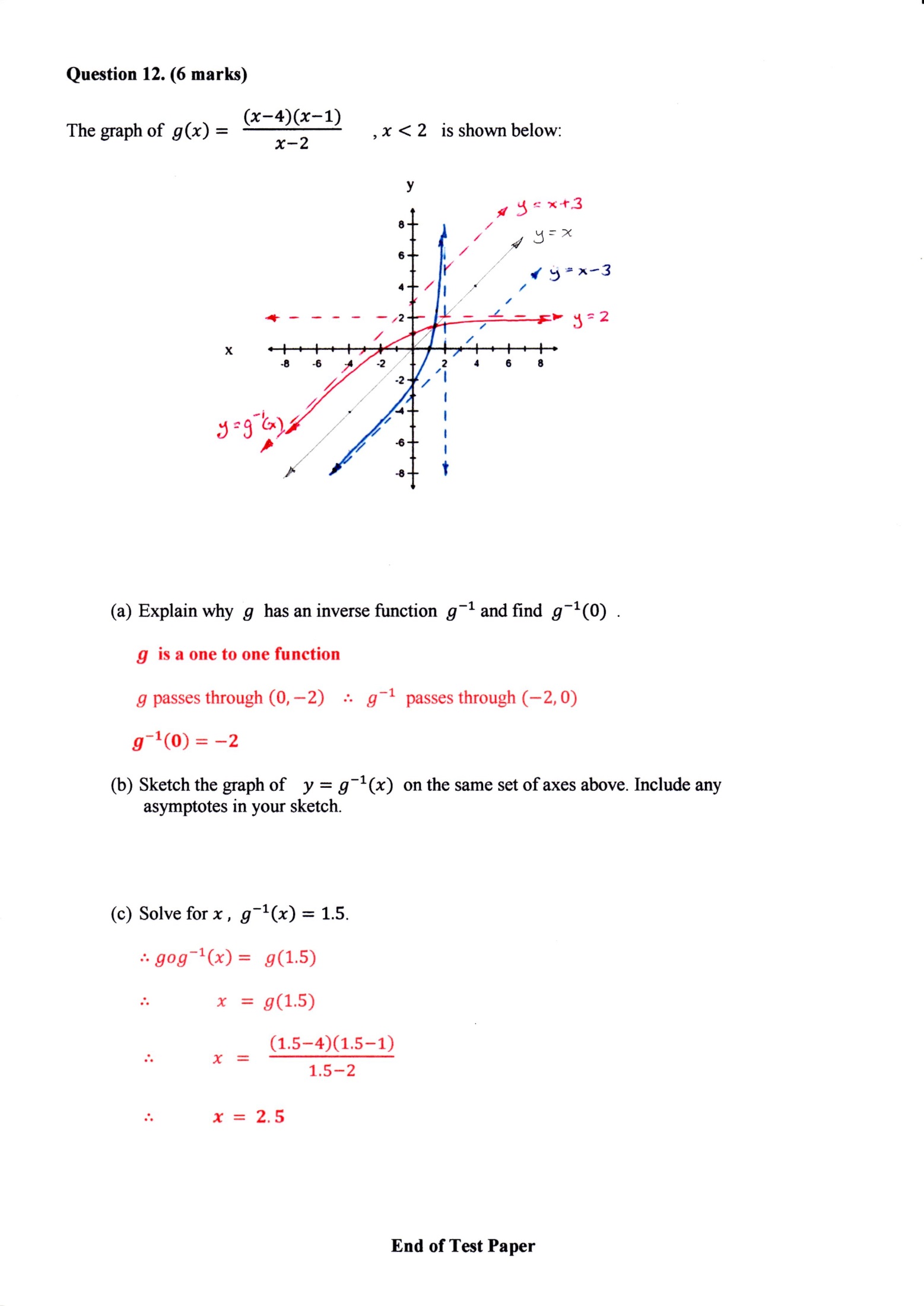
Turning point at **✓**

Graph intersects at points with y-ordinate 1 **✓**

Symmetry **✓**

**Question 13. (6 marks)**

The graph of , is shown below:



**✓✓**

1. Explain why has an inverse function and find . (2)

**is a one to one function ✓**

passes through passes through

**✓**

1. Sketch the graph of on the same set of axes above. Include any

asymptotes in your sketch. (2)

The graphs, including asymptotes, of and have symmetry about the line

1. Solve for . (2)

**✓**

**✓**

**End of Test Paper**