Mathematics Specialist
Unit 3

TEST 2

Student name: _____   Teacher name: _____

Time allowed for this task: 50 minutes, in class, under test conditions
                                     Calculator-Free

Materials required:
Standard items: Pens (blue/black preferred), pencils (including coloured), sharpener,
                                     correction fluid/tape, eraser, ruler, highlighters, SCSA Formula Sheet.

Special items: Drawing instruments, templates

Marks available: 44 marks

Task weighting: **8%**

Question 1 **(3 marks)**

If $g(x) = \dfrac{\sqrt{x^2 - 1}}{x}$,find all solutions to:

(a) $g(\sqrt{2})$

(b) $g(0\cdot5)$

Question 2 **(4 marks)**

State the domain and range of the following.

(a) $h(x) = \dfrac{1}{x + 1}$

(b) $m(x) = \sqrt{x^2 - 9}$
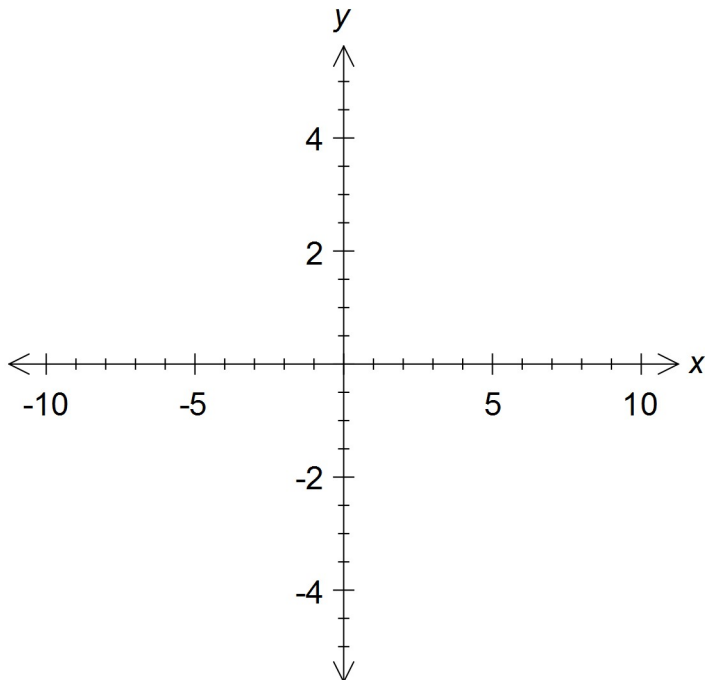
Question 3 **(8 marks)**

The functions f and g are given by

$$f(x) = 3 - \sqrt{x} \text{ and } g(x) = (3 - x)^2.$$

(a) Determine the function defined by $y = f(g(x))$ and show that it is defined for all real values of x.

(3 marks)

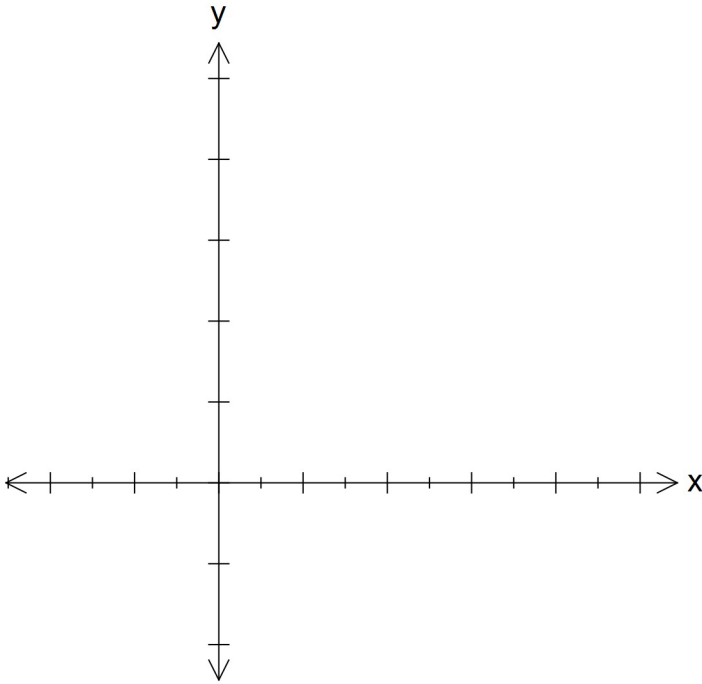(b) On the axes below, sketch the composite function $y = f(g(x))$. (2 marks)

(c) How should the domain of $g(x)$ be changed so that $f(x)$ and $g(x)$ are inverse functions of each other?

(3 marks)

Question 4   **(10 marks)**

The function $f(x)$ is defined for $x > 0$ by $f(x) = \dfrac{-2 + 3x - x^2}{x^2 - x}$.

(a)   Sketch the graph of $f(x)$ on the axes below.   **(4 marks)**

(b)   What is the range of $f(x)$?   **(2 marks)**

(c) Show that $f^{-1}(x) = \dfrac{2}{x+1}$, and state the domain of $f^{-1}(x)$.

(2 marks)

(d) Sketch the graph of $f^{-1}(x)$ on the **same axes used for part (a)**.
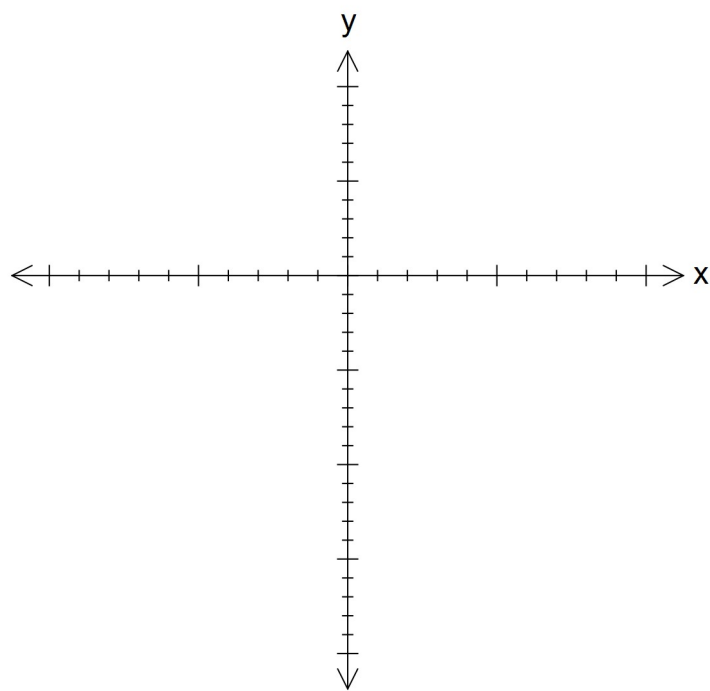Label your sketch clearly. (2marks)

Question 5 **(5 marks)**

If $m(x) = \dfrac{1}{x}$ and $n(x) = 2x + 3$, find the values of x for which $mon(x) = nom(x)$

Sketch the rational function $f(x) = \dfrac{2x^2}{x + 2}$

Question 7 (8 marks)

Solve $|2x + 4| - |x - 5| = -6$ algebraically for x and hence also

Solve $|2x + 4| < |x - 5| - 6$