

**Mathematics Specialist Units 3 & 4
Test 2 2017**

Section 1 Calculator Free

Functions and Sketching Graphs

STUDENT'S NAME: _____

DATE: Tuesday 7th March

TIME: 30 minutes

MARKS: 30

INSTRUCTIONS:

Standard Items: Pens, pencils, pencil sharper, eraser, correction fluid/tape, ruler, highlighters,
Formula Sheet.

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

1. (30 marks)

For the function $f(x) = \frac{x^2 - 2x + 1}{2(x+1)}$

- (a) Determine $f(0)$. [1]
- (b) State the domain of the function. [1]
- (c) Determine the real roots (zeros) for the equation $f(x) = 0$. [2]
- (d) Determine the coordinates and nature (max or min) of any turning points. [4]

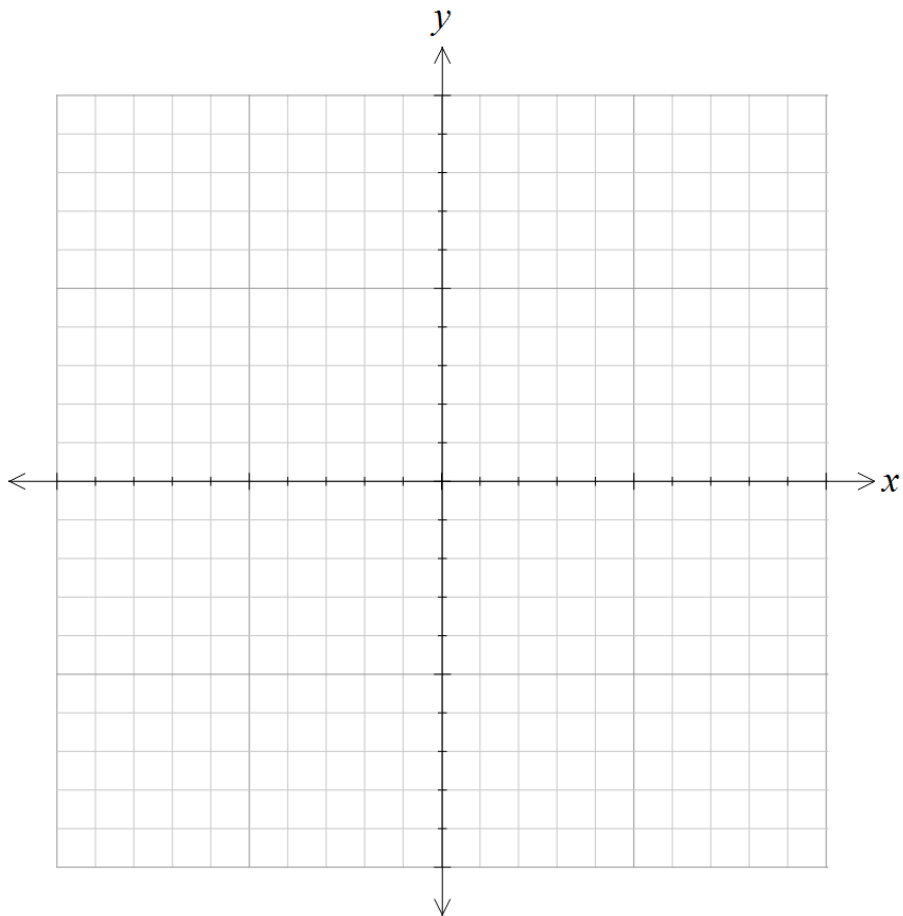
(e) State any asymptotes for the function. [3]

(f) Complete the following statements: [2]

As $x \rightarrow \infty$, $f(x) \rightarrow$

As $x \rightarrow -1^+$, $f(x) \rightarrow$

(g) Sketch the graph of the function, clearly labelling all the above features. [5]



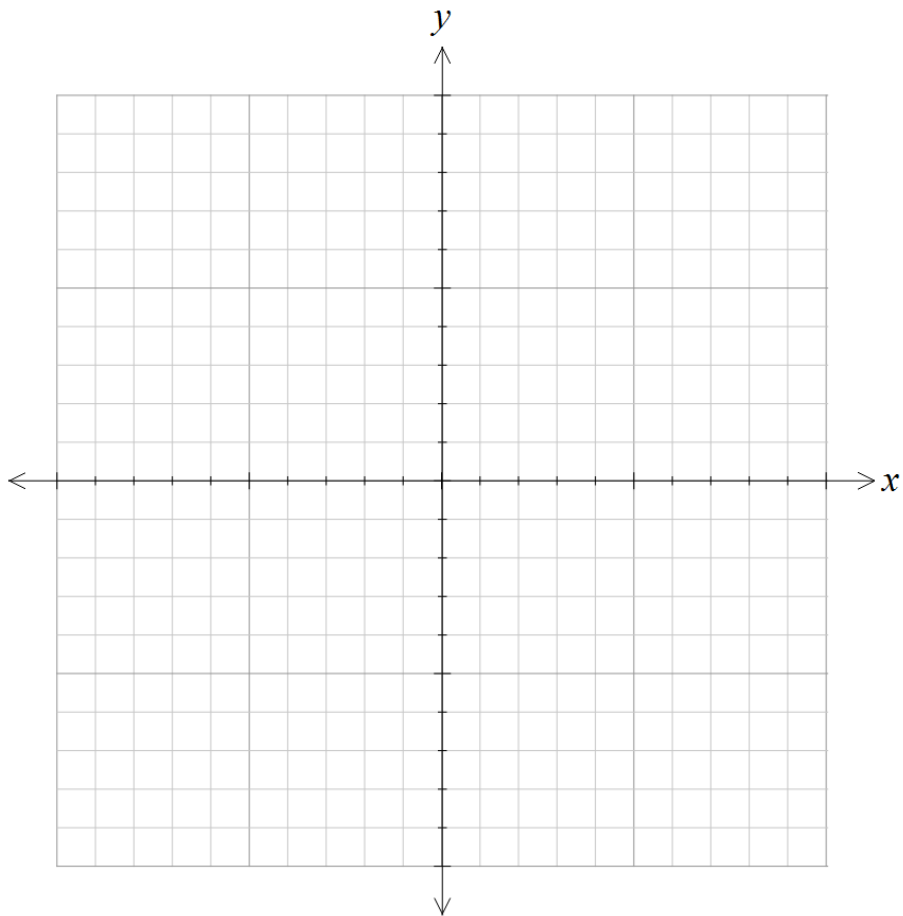
(h) State the range of the function. [2]

(i) What type of relationship is this function? [1]

(j) Does $f^{-1}(x)$ exist? If so, why? If not, why not? [2]

(k) Graph and label $y = (f(x))^{-1}$ on the same set of axes above. [3]

(l) Graph and label $y = |f(x)|$ and $y = f(|x|)$ on the set of axes below. [4]



End of Questions

**Mathematics Specialist Units 3 & 4
Test 2 2017**

Section 2 Calculator Assumed

Functions and Sketching Graphs

STUDENT'S NAME: _____

DATE: Tuesday 7th March

TIME: 20 minutes

MARKS: 20

INSTRUCTIONS:

Standard Items: Pens, pencils, pencil sharper, eraser, correction fluid/tape, ruler, highlighters, Formula Sheet retained from Section 1.

Special Items: Drawing instruments, templates, three calculators, notes on one side of a single A4 page (these notes to be handed in with this assessment).

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

2. (4 marks)

If $f(x) = \frac{1-x}{|x-1|}$ and $g(x) = \frac{1}{x}$, state:

(a) The domain and range for $f(x)$. [2]

(b) State the necessary minimum restriction on the natural domain of $g(x)$ so that $y = f(g(x))$ exists. [2]

3. (4 marks)

For the function $f(x) = \frac{1}{1-x} - 1$, determine the inverse function $f^{-1}(x)$.

4. (4 marks)

Given that $f(g(x)) = x^2 + 4x + 13$ and $f(x) = x^2 + 9$, determine the rule for $g(x)$.

5. (4 marks)

Given $f(x) = \frac{x}{x+1}$, solve for x if $3f(x) + f\left(\frac{1}{x}\right) = 2$

6. (4 marks)

Solve the following:

(a) $|2x+1| = |x-5|$ [2]

(b) $|2x-3| \geq 2$ [2]

End of Questions