



Hale School
Mathematics Specialist
Term 1 2018
Test 2 - Functions

Name: _____

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Instructions:

- Calculators are NOT allowed
 - External notes are not allowed
 - Duration of test: 45 minutes
 - Show your working clearly
 - Use the method specified (if any) in the question to show your working (Otherwise, no marks awarded)
 - This test contributes to 6% of the year (school) mark
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Question 1**(6 marks)**

Consider the function $f(x) = \frac{3}{(x-1)^2} + 6$.

(a) Prove that $f(x)$ is not a one – one function. (2 marks)

(b) State the largest value of a for which $f(x)$ over the domain $\{x : x \leq a, x \in \mathbf{R}\}$ is a one-one function. (1 mark)

(c) For the domain in part (b), find, $f^{-1}(x)$, the inverse function of $f(x)$. (3 marks)

Question 2**(7 marks)**

If $g(x) = (x + 2)^2$ and $h(x) = \frac{1}{3x - 1}$, find:

(a) $h \circ g(-3)$ (1 mark)

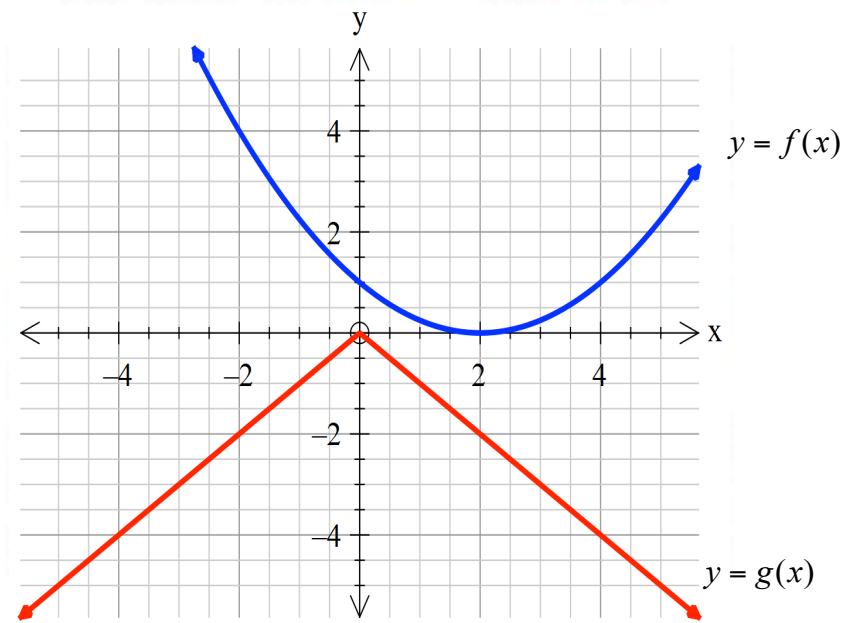
(b) the natural domain of $h \circ g(x)$ (3 marks)

(c) the natural range of $h \circ g(x)$ (3 marks)

Question 3

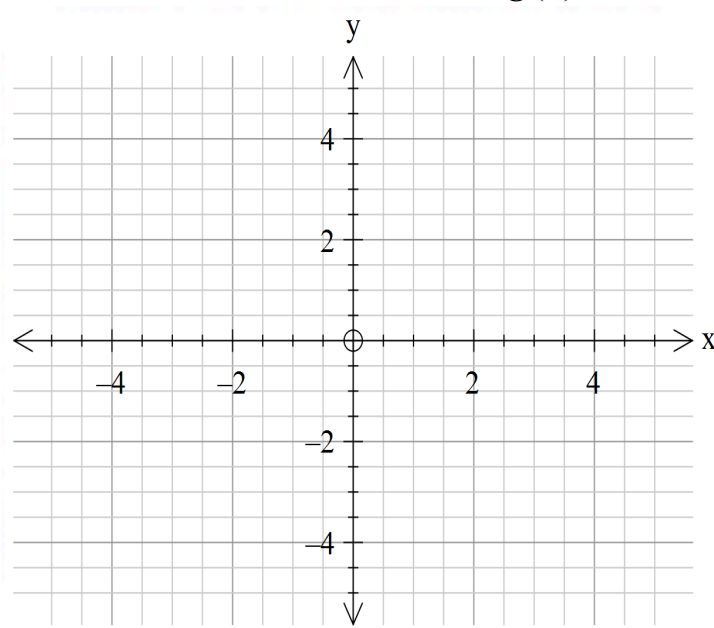
(7 marks)

The axes below show the graphs of $y = f(x)$ and $y = g(x)$



- (a) Find the values of
 - i) $f(g(2))$ (1 mark)
 - ii) a so that $g(f(a)) = -1$ (2 marks)

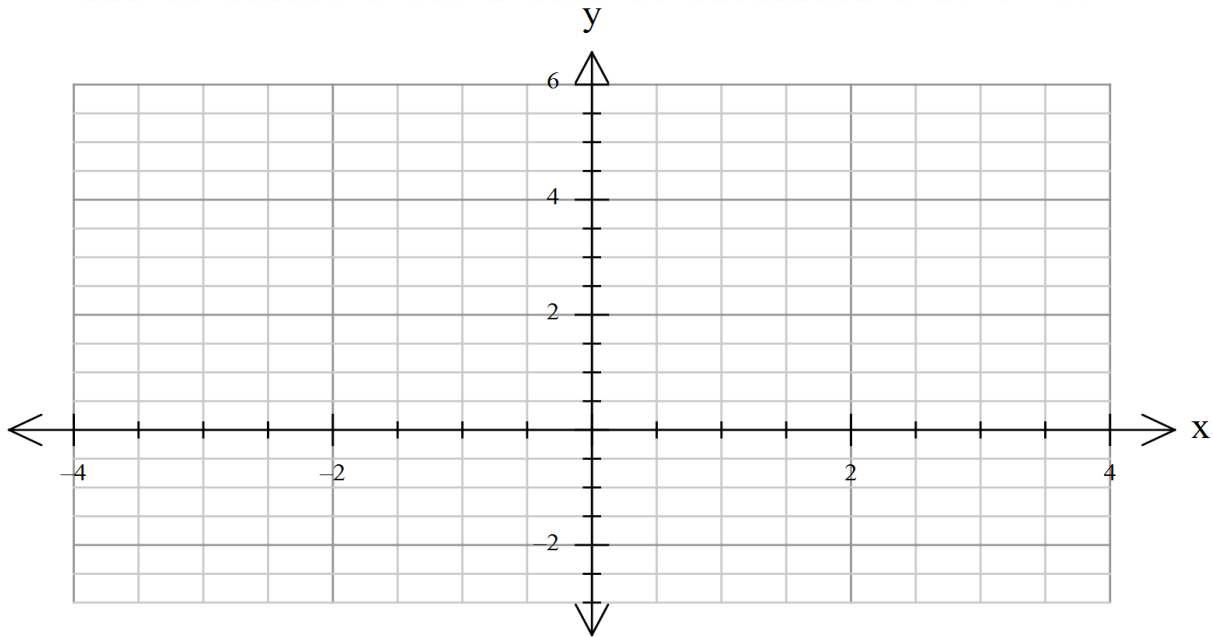
- (b) On the axes below draw the graphs of $\frac{1}{g(x)}$ and $fg(x)$ (4 marks)



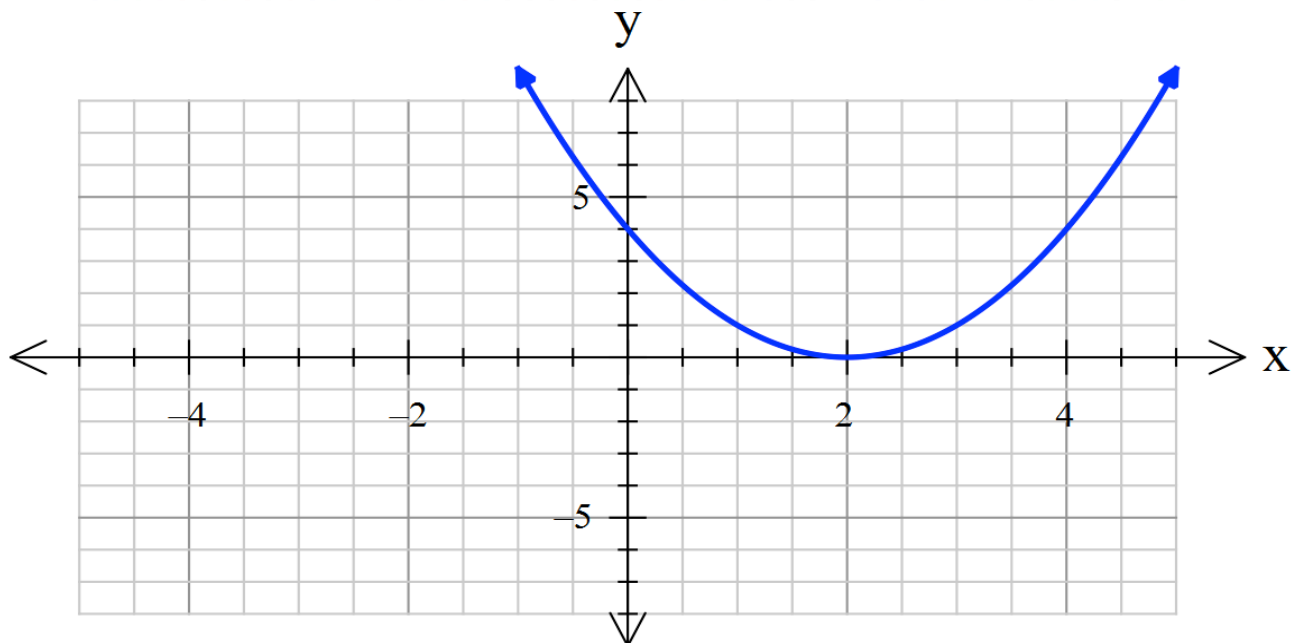
Question 4

(6 marks)

- (a) On the axes below accurately sketch the graph of $y = |x - |x - 2||$. (3 marks)



- (b) The graph of $y = f(x)$ has been drawn on the axes below. On the same axes draw an accurate sketch of the graph of $y = \frac{1}{f(|x|)}$. (3 marks)

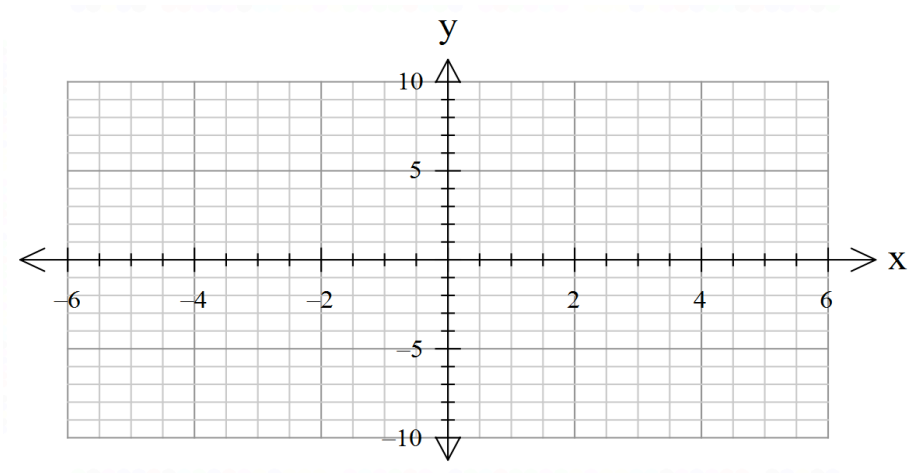


Question 5

(7 marks)

Consider the functions $f(x) = 3|x| - 6$, $g(x) = |x - 3|$ and $h(x) = m|x| + b$

- (a) On the axes below, draw the graphs of $y = f(x)$ and $y = g(x)$ (2 marks)



- (b) Determine the exact values of x for which $f(x) = g(x)$. (2 marks)

- (c) State the values of m , b and k for which the solution set for the equation $h(x) = g(x)$ is $\{x : x \in \mathbf{R}, 0 \leq x \leq k\}$ (3 marks)

Question 6**(4 marks)**

The graph of $y = \frac{ax^2 + bx + 4}{x - c}$ has an oblique asymptote of $y = 2x - 1$ and a vertical asymptote at $x = 3$. Determine the values of a , b and c .