IB Maths SL mini Topic Exam: Functions & Equations

Recommended Time: 40mins. Total Mark: /49

Student Name: ___________________ Teacher: _______________

Question 1

[Maximum mark: 6] 

Let $f(x) = x^3$ and $g(x) = 2x - 1$.

(a) Find $g^{-1}(x)$. [2]

(b) Find $g \circ f(x)$. [2]

(c) Solve $g \circ f(x) = 0$. [2]

Working

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Question 2

[Maximum mark: 6] 

Let \( f(x) = \sqrt{x + 7}, \) for \( x \geq -7. \)

(a) Find \( f^{-1}(3). \)  

(b) Let \( g \) be a function such that \( g^{-1} \) exists for all real numbers. Given that \( g(9) = 4, \) find \((f \circ g^{-1})(4).\)
Question 3

[Maximum mark: 7]

Let \( f(x) = x^2 + kx \) and \( g(x) = x + k \). The graphs of \( f \) and \( g \) intersect at two distinct points.

Find the values of \( k \).

Working

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Question 4

[Maximum mark: 15]

Let \( f(x) = 3x^2 + 12x + 9 \)

(a) (i) Find the y-intercept of \( f \); 
(ii) Find the x-intercepts of \( f \). \[4\]

The function can be written in the form \( f(x) = a(x - h)^2 + k \).

(b) Find the value of

(i) \( a \); 
(ii) \( h \); 
(iii) \( k \). \[5\]

(c) (i) Write down the co-ordinate of the vertex of \( f \). 
(ii) Write down the equation of the axis of symmetry of \( f \). \[2\]

(d) The function \( g(x) \) is obtained from the graph of \( f \) by a reflection in the x-axis, followed by a translation by the vector \( \begin{pmatrix} 0 \\ -4 \end{pmatrix} \). Find \( g \), giving your answer in the form \( g(x) = Ax^2 + Bx + C \). \[4\]
Question 5

[Maximum mark: 15]

Let \( f(x) = \frac{5}{x+1} \) and \( g(x) = x - 3 \).

(a) For the graph of \( f \), find

(i) y-intercept;
(ii) x-intercept;
(iii) the equation of the vertical asymptote. \[5\]

(b) The graph of \( f \) and \( g \) intersect at \( A(x, y) \) and point \( B(x, y) \). Find the coordinates of points \( A \) and \( B \). \[5\]

(c) Find the equation of the linear line that passes through \( A \) and \( B \), in the form of \( y = mx + c \). \[3\]

(d) Write down the gradient of the line that is perpendicular to the line passing through \( A \) and \( B \). \[2\]

**Working**

More working space over page