Name _____ **Due Date: August of Senior Year**

Summer Assignment for IB Math Senior Level

1. The function f is given by $f(x) =$.
Find the domain of the function.

(Total 4 marks)

2. The functions $f(x)$ and $g(x)$ are given by $f(x) =$ and $g(x) = x^2 + x$.
The function $(f \circ g)(x)$ is defined for $x \in$, **except** for the interval $]\, a, b\, [$.

(a) Calculate the value of a and of b.

(b) Find the range of $f \circ g$.

(Total 6 marks)

3. The function f is given by $f(x) = e^{(x-11)} - 8$.

(a) Find $f^{-1}(x)$.

(b) Write down the domain of $f^{-1}(x)$.

(Total 6 marks)

4. Let $f(x) = 2x + 1$ and $g(x) = 3x^2 - 4$.

Find

(a) $f^{-1}(x)$;

(b) $(g \circ f)(-2)$;

(c) $(f \circ g)(x)$.

(Total 6 marks)

5. (a) Factorise $x^2 - 3x - 10$.

(b) Solve the equation $x^1 - 3x - 10 = 0$.

(Total 4 marks)

6. The diagram shows the parabola $y = (7 - x)(1 + x)$.
The points A and C are the x-intercepts and the point B is the maximum point.

Find the coordinates of A, B and C.

(Total 4 marks)

7. (a) Express $f(x) = x^2 - 6x + 14$ in the form $f(x) = (x - h)^2 + k$,
where h and k are to be determined.

(b) Hence, or otherwise, write down the coordinates of the vertex of the parabola with equation $y - x^2 - 6x + 14$.

(Total 4 marks)

8. The function f is given by $f(x) = x^2 - 6x + 13$, for $x \geq 3$.

(a) Write $f(x)$ in the form $(x - a)^2 + b$.

(b) Find the inverse function f^{-1}.

(c) State the domain of f^{-1}.

(Total 6 marks)

9. Consider the functions $f : x \ 4 (x - 1)$ and $g : x$.

(a) Find g^{-1}.

(b) Solve the equation $(f \circ g^{-1})(x) = 4$.

(Total 6 marks)

10. Consider the function $f(x) = 2x^2 - 8x + 5$.

(a) Express $f(x)$ in the form $a(x - p)^2 + q$, where $a, p, q \in$.

(b) Find the minimum value of $f(x)$.

(Total 6 marks)

11. Find the sum of the arithmetic series

$$17 + 27 + 37 + ... + 417.$$

(Total 4 marks)

12. The diagram represents the graph of the function

$$f : x \ (x - p)(x - q).$$

(a) Write down the values of p and q.

(b) The function has a minimum value at the point C. Find the x-coordinate of C.

(Total 4 marks)

13. In an arithmetic sequence, the first term is –2, the fourth term is 16, and the n^{th} term is 11 998.

(a) Find the common difference d.

(b) Find the value of n.

(Total 6 marks)

14. Let S_n be the sum of the first n terms of an arithmetic sequence, whose first three terms are u_1, u_2 and u_3. It is known that $S_1 = 7$, and $S_2 = 18$.

(a) Write down u_1.

(b) Calculate the common difference of the sequence.

(c) Calculate u_4.

(Total 6 marks)

15. Find the sum of the infinite geometric series

(Total 4 marks)