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VCE Mathematical Methods ¾
Functions & Relations [1.1]
Test

17.5 Marks. 1 Minute Reading. 21 Minutes Writing.

Results:

Test Questions	_____ / 17.5
Extension	_____ / 5

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Section A: Test Questions (17.5 Marks)

INSTRUCTION: 17.5 Marks. 21 Minutes Writing.

Question 1 (2.5 marks)

Tick whether the following statements are **true** or **false.**

	True	False
a. Inside of the log can be all non negative numbers.		
b. To calculate the maximal domain of sum of two functions, you find the union of the two domain.		
c. Composite function is only defined if the range of the inside is a subset of the domain of the outside.		
d. Composite function's range is always the range of the outside function.		
e. The composition of inverse functions is always equal to $y = x$ with a domain equal to domain of inside.		

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Question 2 (2 marks)

Consider the following functions both defined on their maximal domains.

$$f(x) = -\sqrt{x+15}$$

$$g(x) = \log_2(-x+4)$$

Find the maximal domain of $f(x) + g(x)$.

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Question 3 (5 marks)

Consider the following functions both defined on their maximal domains.

$$f(x) = \sqrt{4 - x^2}$$

$$g(x) = x^2 + 3$$

a. State whether $f(g(x))$ or $g(f(x))$ is defined. (1 mark)

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b. Find the rule and domain of the composite function which is defined from **part. a**. (2 marks)

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c. Find the range of the composite function which is defined from **part. a**. (2 marks)

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Question 4 (8 marks)

Consider the following function:

$$f:(-\infty, a] \to R, f(x) = x^2 - 4x - 6$$

a. Solve for the largest value of a such that, the inverse function f^{-1} exists. (1 mark)

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b. Define the function $f^{-1}(x)$. (3 marks)

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c. Find the point of intersection between $f(x)$ and $f^{-1}(x)$. (2 marks)

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d. Define the function $f^{-1}\left(f(x)\right)$. (2 marks)

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Section B: Extension Test Questions (5 Marks)

INSTRUCTION: 5 Marks. 3 Minutes Writing.

Question 5 (5 marks)

Consider the following functions defined on their maximal domains.

$$f(x) = x^2 - 4$$

$$g(x) = \frac{1}{\sqrt{x - 5}}$$

a. Restrict the domain of f so that the composite function $g \circ f$ is defined. (2 marks)

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b. Hence, define the function $g \circ f$. (1 mark)

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Let $h(x) = x^4 - 2kx^2 + 21$ where $k > 0$.

c. Find the range of values of k for which the function $g \circ h$ exists. (2 mark)

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