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VCE Mathematical Methods ½
Functions & Relations II [2.2]
Test

24 Marks. 29 Minutes Writing.

Results:

Test Questions	_____ / 24
Extension Questions	_____ / 3

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Section A: Test Questions (24 Marks)

Question 1 (4 marks)

Tick whether the following statements are **True** or **False**.

Statement	True	False
a. A function's domain will always be its maximal domain.		
b. The expression inside a square root can only be positive.		
c. All hybrid functions must "join together", i.e., be continuous.		
d. $f: D \rightarrow R, f(x) = x^2 + 4$ has a range of R.		
e. A function and its inverse are always symmetrical around $y = x$.		
f. A relation needs to be one to one, for it to have an inverse relation.		
g. A function needs to be one to one, for it to have an inverse function.		
h. Instead of equating $f(x)$ with its inverse to find the intersection between $f(x)$ and $f^{-1}(x)$, we can equate $f(x)$ to $y = x$ most of the time.		

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Question 2 (4 marks)

State the implied domain and range for each of the relations below.

a. $y = 1 - \sqrt{1 - x}$. (2 marks)

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b. $y = \sqrt{x^2 + 2x + 1}$. (2 marks)

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Question 3 (6 marks)

A function $g(x)$ is defined as,

$$g(x) = \begin{cases} x^3 + 1, & x \leq 0 \\ (x-2)^2 - 1, & 0 < x < 3 \\ 3, & x \geq 3 \end{cases}$$

a. Draw the graph of $y = g(x)$ on the axes below. (3 marks)
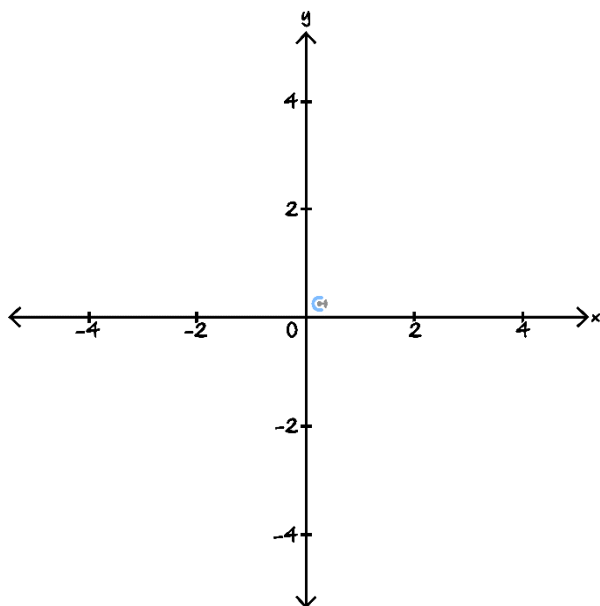
b. State the number of solutions to $g(x) = -\frac{1}{2}$. (1 mark)

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c. State the range of $g(x)$. (1 mark)

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d. Solve the equation $g(x) = 3$. (1 mark)

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Question 4 (10 marks)

Consider the function $f: [0, a] \to R, f(x) = -(x-2)^2 + 4$.

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

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b. State the domain and range of the inverse of f. (2 marks)

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c. Determine the equation of the inverse function f^{-1}. (3 marks)

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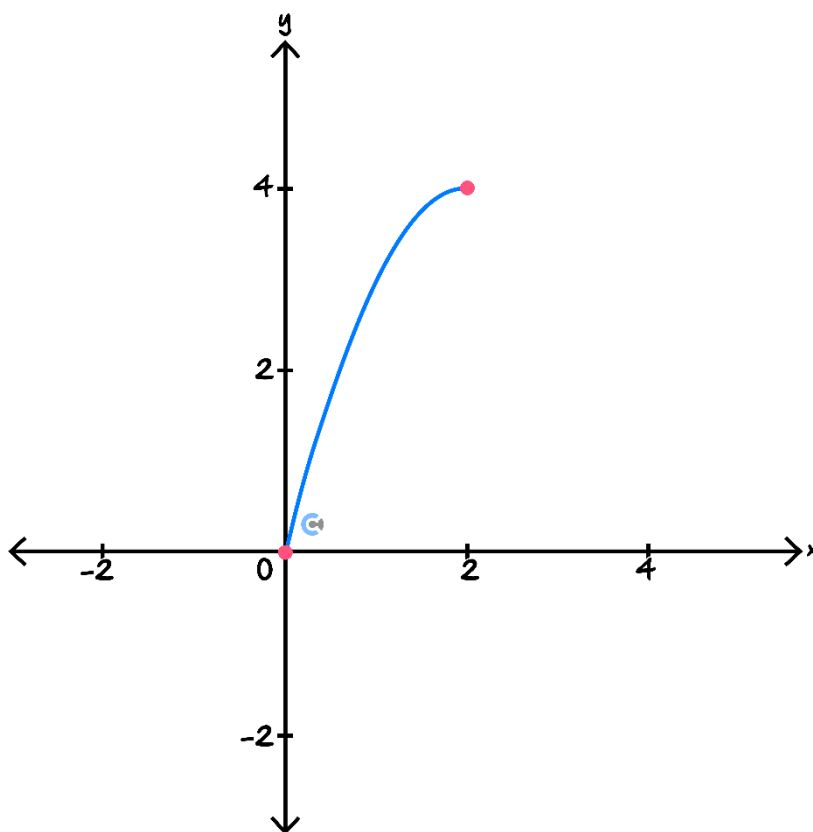**d.** The graph of f is shown on the graph below. On the same set of axes, sketch accurately the graph of the inverse of f. (3 marks)

e. Find an intersection point between f and f^{-1}. (1 mark)

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Section B: Extension Questions (3 Marks)

Question 5 (3 marks)

Consider the function below.

$$f:[0,3] \to R, f(x) = x^2 - 6x + k, \text{ where } k > 0$$

Find the value(s) of k such that f and f^{-1} never intersect.

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