Student Name: _____

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Creating VCE Success

MATHEMATICAL METHODS 2020

Unit 3
Key Topic Test 3 –Functions and Relations Technology Free

Recommended writing time: 45 minutes
Total number of marks available: 30 marks

QUESTION BOOK

* The recommended writing time is a guide to the time students should take to complete this test. Teachers may wish to alter this time and can do so at their own discretion.

Conditions and restrictions

- Students are permitted to bring into the room for this test: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the room for this test: blank sheets of paper and/or white out liquid/tape.
- No calculator is permitted in this test.

Materials supplied

- Question and answer book of 7 pages.

Instructions

- Print your name in the space provided on the top of the front page.
- All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic communication devices into the room for this test.

Instructions

Answer all questions in the spaces provided.

In all questions where a numerical answer is required, an exact value must be given, unless otherwise specified.

In questions where more than one mark is available, appropriate working must be shown.

Unless otherwise indicated, the diagrams in this book are not drawn to scale.

Question 1 (11 marks)

For the functions $f: [-2, \infty) \to R, f(x) = \sqrt{2x + 4}$ and $g: (0, \infty) \to R, g(x) = \frac{1}{x}$;

a. Find $f^{-1}(x)$ and state its domain.

3 marks

b. Find the coordinates of the intersection of $y = f(x)$ and $y = f^{-1}(x)$

3 marks

c. Find $f(g(x))$ and state its domain.

_____

_____

_____

_____

_____

2 marks

d. Explain why $g(f(x))$ does not exist.

_____

_____

_____

1 mark

e. State the domain for $(f+g)(x)$

_____

1 mark

f. Find $(f+g)(5)$

_____

1 mark

Question 2 (10 marks)

For $f: [a, \infty) \to R, f(x) = x^2 - 4x + 3$;

a. Find the minimum value of a such that $f^{-1}(x)$ exists

_____

_____

2 marks

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

_____

_____

_____

_____

2 marks

c. Find $f^{-1}\big(f(x)\big)$

_____

_____

_____

_____

2 marks

d. For $a = 0$, find $\{x: f(x) = -1\}$

_____

_____

2 marks

e. For $a = 2$, find $\{x: f^{-1}(x) = 4\}$

_____

_____

_____

2 marks

Question 3 (9 marks)

For the function $f: (1, 4] \rightarrow R, f(x) = \frac{1}{x-1} + 1$;

a. State the range of $f(x)$

_____

_____

2 marks

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

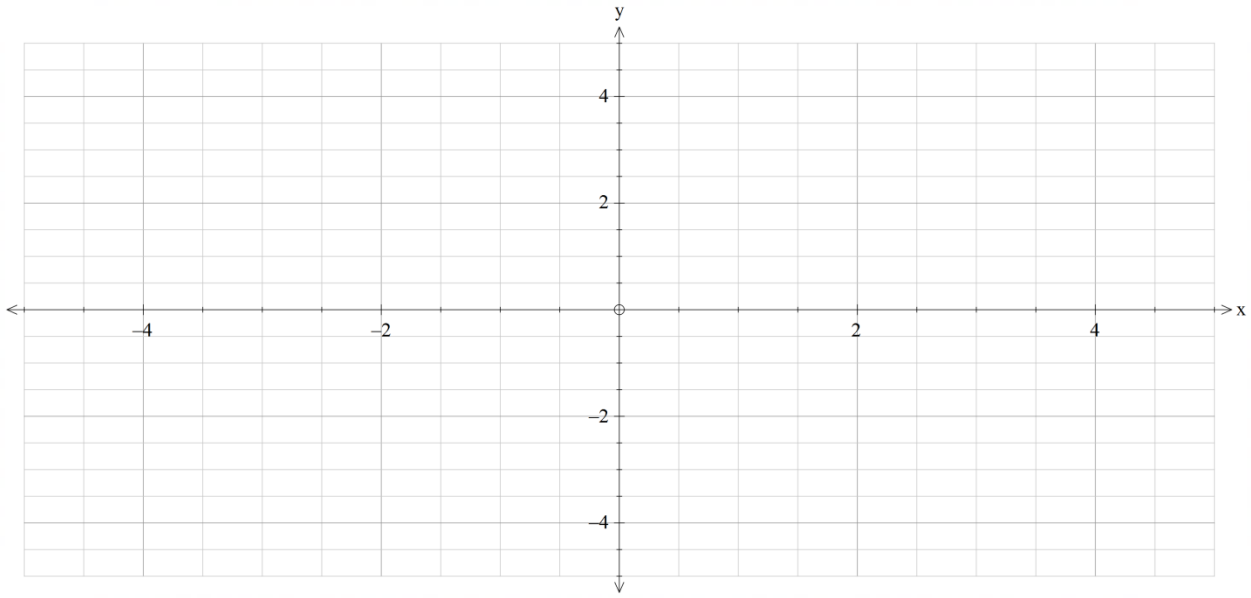
_____

_____

_____

2 marks

c. Sketch the graphs of $= f(x)$, labelling all asymptotes, intercepts and endpoints.



3 marks

d. For $(gh)(x) = f(x)$, find $h(x)$ in the form $(ax + b)^c$ given $g(x) = x$

_____

_____

_____

2 marks

END OF KEY TOPIC TEST