

Unit 2: Functions

Subunit 2.2: Composition of functions and range

Topical Question No: 1

9 Functions f , g and h are defined as follows:

$$f : x \mapsto x - 4x^{\frac{1}{2}} + 1 \quad \text{for } x \geq 0,$$

$g : x \mapsto mx^2 + n$ for $x \geq -2$, where m and n are constants,

$$h : x \mapsto x^{\frac{1}{2}} - 2 \quad \text{for } x \geq 0.$$

- (a) Solve the equation $f(x) = 0$, giving your solutions in the form $x = a + b\sqrt{c}$, where a , b and c are integers. [4]

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- (b) Given that $f(x) \equiv gh(x)$, find the values of m and n . [4]

[illegible]

Topical Question No: 2

- 9** The functions f and g are defined for all real values of x by

$$f(x) = (3x-2)^2 + k \quad \text{and} \quad g(x) = 5x-1,$$

where k is a constant.

- (a) Given that the range of the function g is $g(x) \geq 39$, find the value of k . [4]

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- (b) For this value of k , determine the range of the function fg . [2]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and run across the entire width of the page. There are no margins, text, or other markings present.

Topical Question No: 3

6 Functions f and g are defined for $x \in \mathbb{R}$ by

$$f : x \mapsto \frac{1}{2}x - a,$$

$$g : x \mapsto 3x + b,$$

where a and b are constants.

(a) Given that $gg(2) = 10$ and $f^{-1}(2) = 14$, find the values of a and b . [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Using these values of a and b , find an expression for $gf(x)$ in the form $cx + d$, where c and d are constants. [2]

.....

.....

.....

.....

.....

.....

.....

Topical Question No: 4

5 The function f is defined by $f(x) = 2x^2 + 3$ for $x \geq 0$.

(a) Find and simplify an expression for $\text{ff}(x)$. [2]

[illegible]

(b) Solve the equation $ff(x) = 34x^2 + 19$. [4]

This image shows a full page of a worksheet designed for handwriting practice. It features ten sets of horizontal dashed lines spaced evenly down the page, providing a guide for letter height and placement. The background is plain white, and there are no other markings or text present.

Topical Question No: 5

8 Functions f and g are defined as follows:

$$f : x \mapsto x^2 - 1 \text{ for } x < 0,$$

$$g : x \mapsto \frac{1}{2x+1} \text{ for } x < -\frac{1}{2}.$$

(a) Solve the equation $\text{fg}(x) = 3$. [4]

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(b) Find an expression for $(fg)^{-1}(x)$. [3]

.....

.....

.....

.....

.....