

- [3]

[illegible]

- (b)** The graph of $y = x^2$ is transformed to the graph of $y = 1 - 6x - x^2$ by a reflection followed by a translation of $\begin{pmatrix} m \\ n \end{pmatrix}$. Give details of the reflection and determine the values of m and n . [3]

[illegible]

6

$$f(x) = (x+3)^2 - 12 \quad \text{for } x \geq 0,$$

$$g(x) = 2x - 5 \quad \text{for } x \in \mathbb{R}.$$

- (a)** State the range of f .

.....

.....

.....

.....

- (b)** Find an expression for $f^{-1}(x)$.

[illegible]

- (c)** Solve the equation $gf(x) = 69$.

[illegible]

3

(a) The graph of $y = f(x)$ is transformed to the graph of $y = f(3x) + 2$.

[3]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing 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) A different graph has equation $y = g(x)$. This graph is stretched by scale factor 3 in the y -direction and then reflected in the y -axis.

[2]

[illegible]

9

- (a) Find an expression for $f'(x)$ and hence determine whether f is an increasing function, a decreasing function or neither. [4]

[illegible]

- (b) State whether f^{-1} exists. Give a reason for your answer. [1]

[illegible]

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The function g is defined by $g(x) = 4x - 3$ for $x > a$.

- (c) Find the range of g in terms of the constant a . [1]

[illegible]

- (d) Find the set of values of a for which the composite function fg exists. [2]

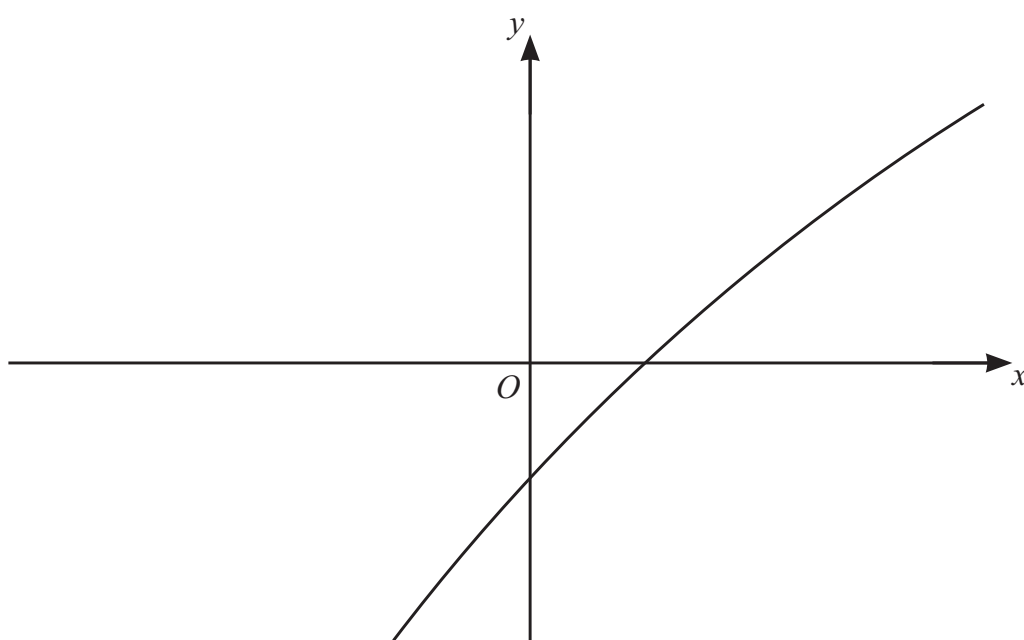
Handwriting practice lines (dotted lines on a solid background) for the letter 'e'.

10 The functions f and g are defined by

$$f(x) = \sqrt{x} \quad \text{for } x \geq 0,$$

$$g(x) = 3\sqrt{x+2} - 5 \quad \text{for } x \geq -2.$$

- (a)** Describe fully a sequence of transformations which transforms the graph of $y = f(x)$ to the graph of $y = g(x)$. You should make clear the order in which the transformations are applied. [5]

This image shows a blank sheet of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no other markings or text on the page.

The diagram shows the graph of $y = g(x)$.

- (b)** On the diagram sketch the graph of $y = g^{-1}(x)$ together with any relevant mirror line. [2]

(c) Find an expression for $g^{-1}(x)$. [2]

(d) State the range of g^{-1} . [1]

The function h is defined by

$$h(x) = x - 2 \quad \text{for } x \geqslant 0.$$

(e) Find the value of $g^{-1}h(4)$. [1]

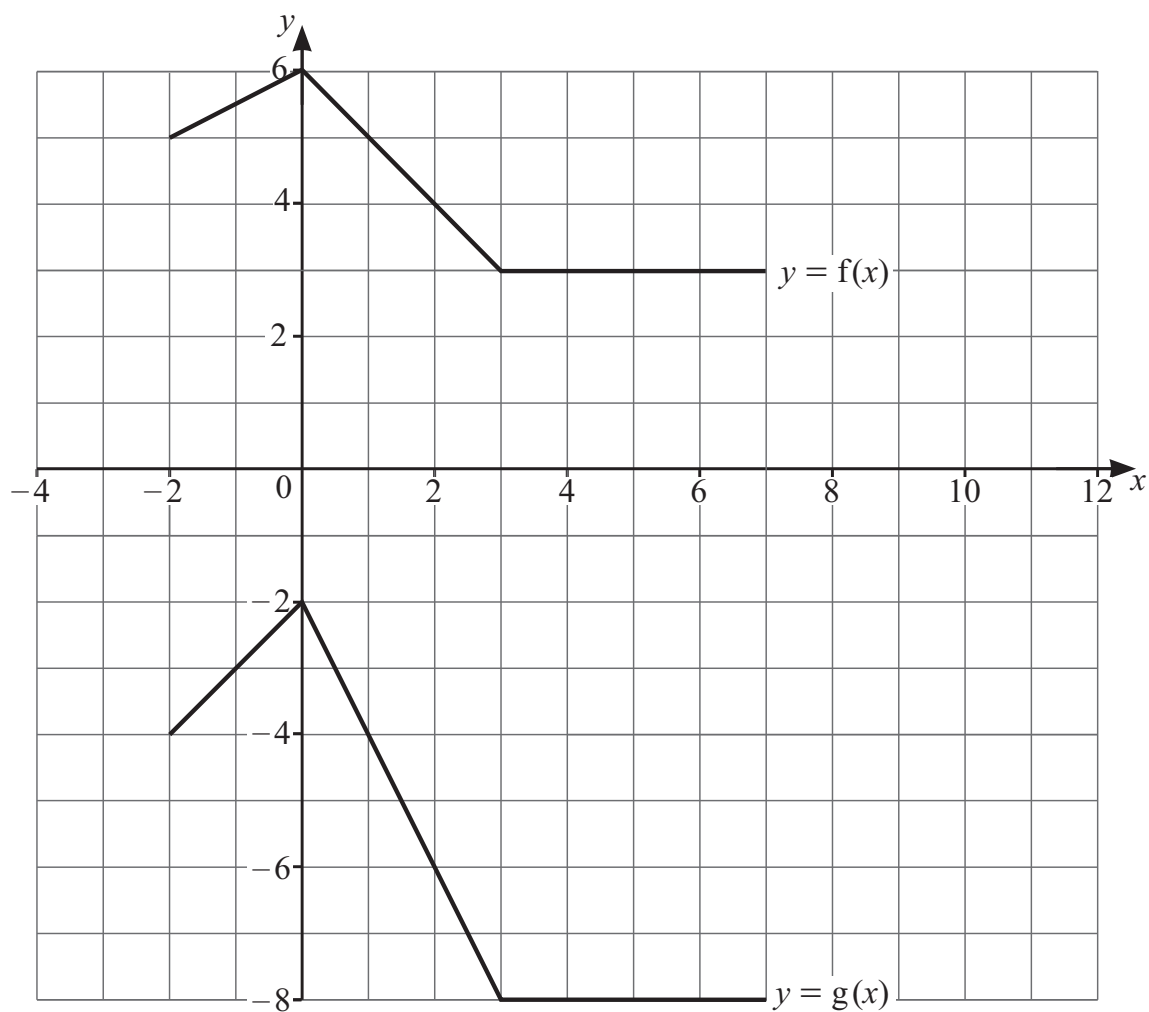
(f) Explain why the composite function hg^{-1} cannot be formed. [1]

Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting or typing. There are no margins, text, or other markings on the page.

1



The diagram shows the graphs with equations $y = f(x)$ and $y = g(x)$.

Describe fully a sequence of two transformations which transforms the graph of $y = f(x)$ to the graph of $y = g(x)$. Make clear the order in which the transformations should be applied. [4]

Handwriting practice lines (dotted lines on a grid background).

12 _____

- [2]

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

The functions f and g are defined as follows.

$$f(x) = x^2 + 4x + 2 \quad \text{for } x \leq -2$$

$$g(x) = -x - 4 \quad \text{for } x \geq -2$$

- [3]

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

(ii) Find an expression for $(gf)^{-1}(x)$.

[4]

[illegible]

Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.

[illegible]