

- 2** The graph of $y = f(x)$ is transformed to the graph of $y = 1 + f(\frac{1}{2}x)$.

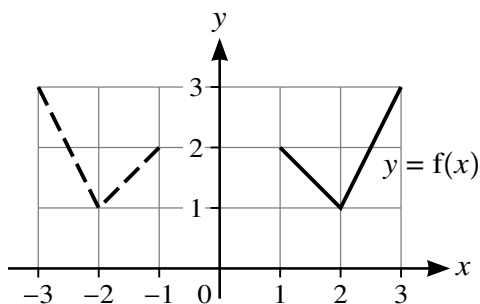
Describe fully the two single transformations which have been combined to give the resulting transformation. [4]

bas1paperpenquin.com

[illegible]

- 3 In each of parts (a), (b) and (c), the graph shown with solid lines has equation $y = f(x)$. The graph shown with broken lines is a transformation of $y = f(x)$.

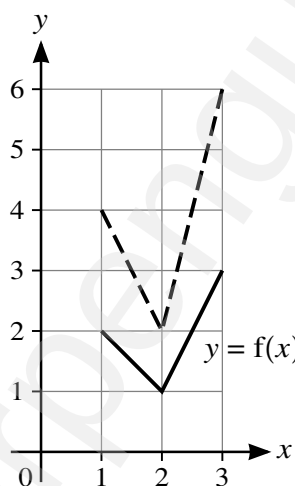
(a)



State, in terms of f , the equation of the graph shown with broken lines.

[1]

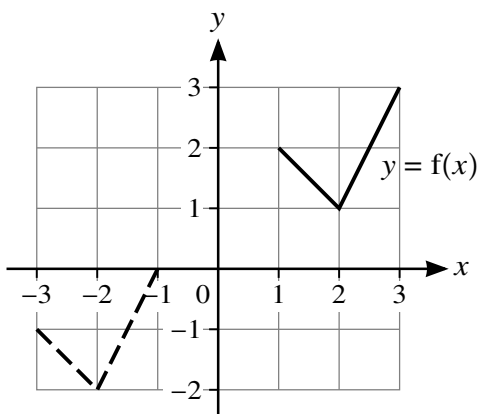
(b)



State, in terms of f , the equation of the graph shown with broken lines.

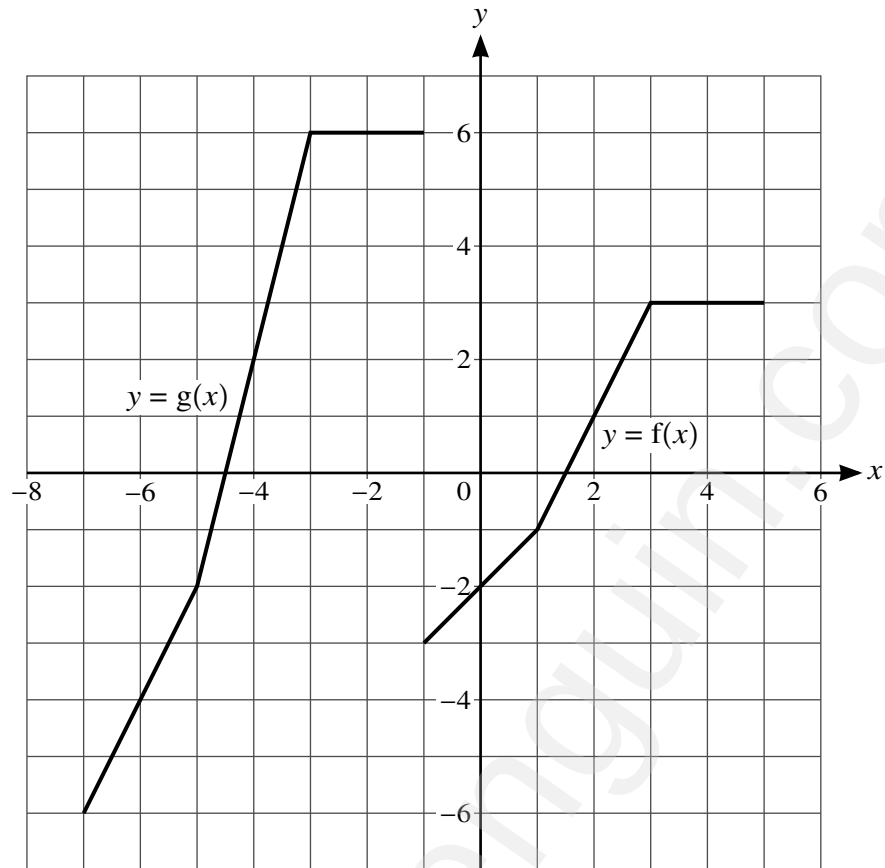
[1]

(c)



State, in terms of f , the equation of the graph shown with broken lines.

[2]



The diagram shows 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 $y = g(x)$. [4]

.....

.....

.....

.....

.....

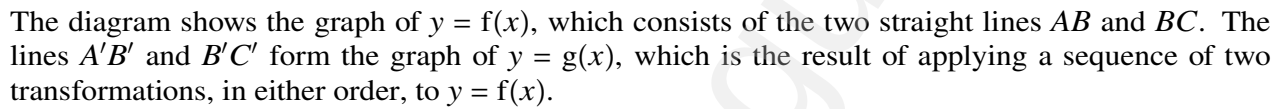
.....

.....

.....

.....

.....



[4]

Handwriting practice paper with horizontal lines.

- 2 The curve $y = x^2$ is transformed to the curve $y = 4(x-3)^2 - 8$.

Describe fully a sequence of transformations that have been combined, making clear the order in which the transformations have been applied. [5]

- 1 (a) Express $x^2 + 6x + 5$ in the form $(x + a)^2 + b$, where a and b are constants. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b) The curve with equation $y = x^2$ is transformed to the curve with equation $y = x^2 + 6x + 5$.
Describe fully the transformation(s) involved. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 2 (a) The graph of $y = f(x)$ is transformed to the graph of $y = 2f(x - 1)$.

Describe fully the two single transformations which have been combined to give the resulting transformation. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b) The curve $y = \sin 2x - 5x$ is reflected in the y -axis and then stretched by scale factor $\frac{1}{3}$ in the x -direction.

Write down the equation of the transformed curve. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- A function f is defined by $f(x) = x^2 - 2x + 5$ for $x \in \mathbb{R}$. A sequence of transformations is applied in the following order to the graph of $y = f(x)$ to give the graph of $y = g(x)$.

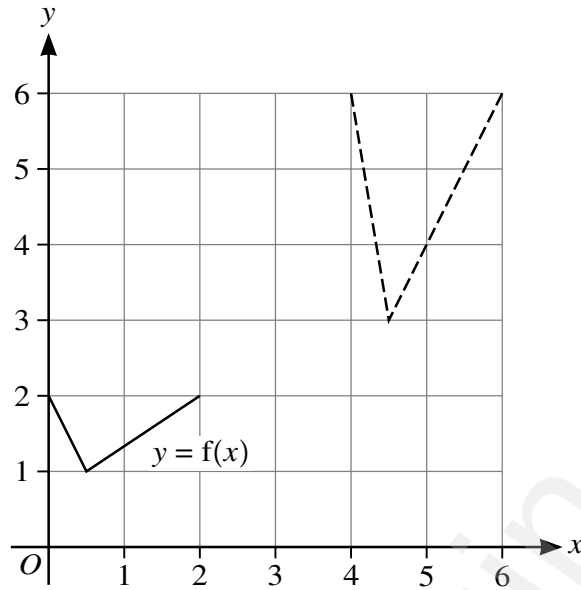
Stretch parallel to the x -axis with scale factor $\frac{1}{2}$

Reflection in the y -axis

Stretch parallel to the y-axis with scale factor 3

Find $g(x)$, giving your answer in the form $ax^2 + bx + c$, where a , b and c are constants. [4]

pastpaperpenquin.com



In the diagram, the graph of $y = f(x)$ is shown with solid lines. The graph shown with broken lines is a transformation of $y = f(x)$.

- (a) Describe fully the two single transformations of $y = f(x)$ that have been combined to give the resulting transformation. [4]

.....

.....

.....

.....

.....

.....

.....

.....

- (b) State in terms of y , f and x , the equation of the graph shown with broken lines. [2]

.....

.....

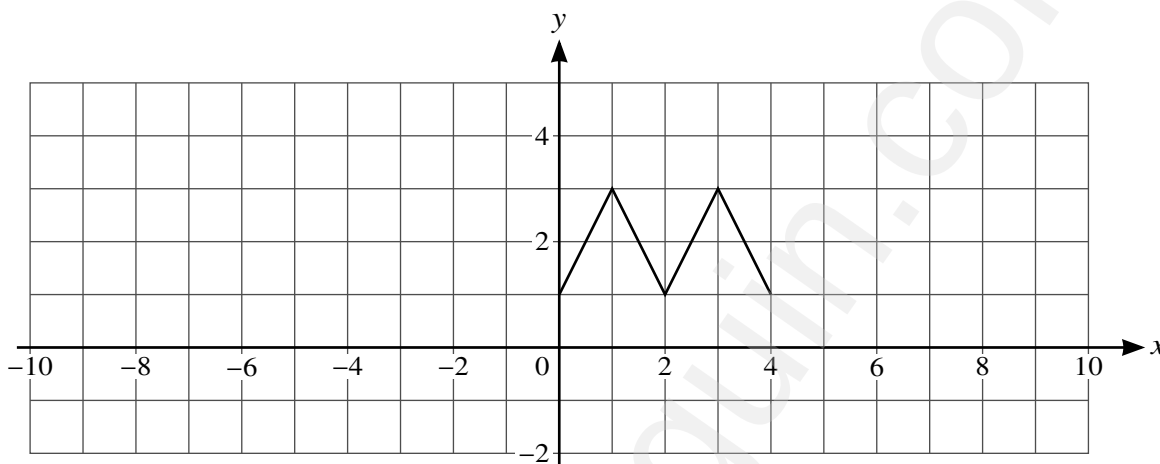
.....

.....

.....

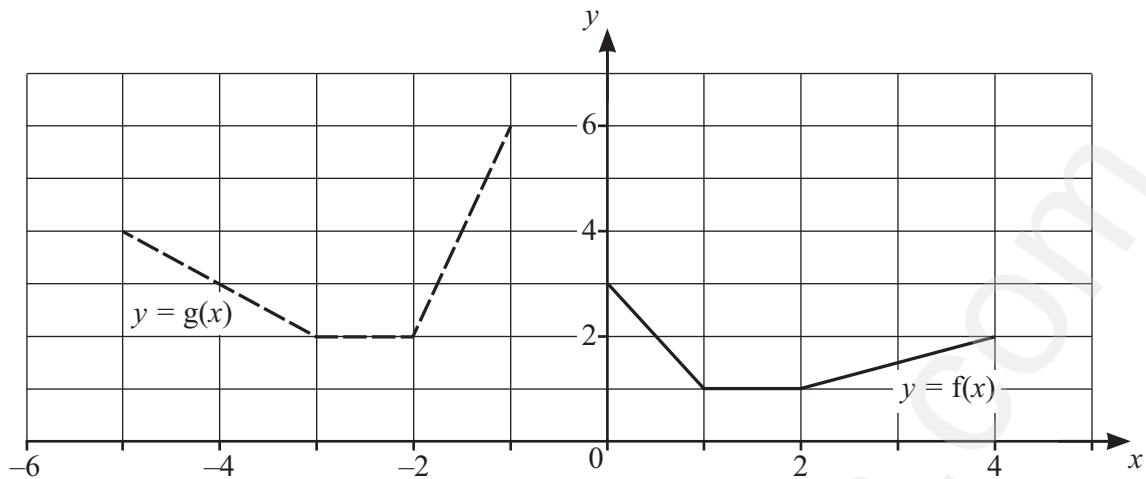
- (a) The diagram below shows the graph of $y = f(x)$.

[3]



- (b) Find an expression for $g(x)$ in terms of $f(x)$. [2]

[illegible]



In the diagram, the graph with equation $y = f(x)$ is shown with solid lines and the graph with equation $y = g(x)$ is shown with broken lines.

- (a) Describe fully a sequence of three transformations which transforms the graph of $y = f(x)$ to the graph of $y = g(x)$. [6]

.....

.....

.....

.....

.....

.....

.....

.....

- (b) Find an expression for $g(x)$ in the form $af(bx + c)$, where a , b and c are integers. [2]

.....

.....

.....

.....

.....

.....

.....

.....



$$\begin{aligned}f(x) &= x^2 - 2x + 5, \\g(x) &= x^2 + 4x + 13.\end{aligned}$$

- (b) Describe fully the transformation which transforms the graph of $y = f(x)$ to the graph of $y = g(x)$. [2]

6 The equation of a curve is $y = x^2 - 8x + 5$.

- (a) Find the coordinates of the minimum point of the curve. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

The curve is stretched by a factor of 2 parallel to the y-axis and then translated by $\begin{pmatrix} 4 \\ 1 \end{pmatrix}$.

- (b) Find the coordinates of the minimum point of the transformed curve. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[illegible]

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

- (a) Describe fully the two single transformations that have been combined to give the resulting transformation. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

The point $P(5, 6)$ lies on the transformed curve $y = f(2x) - 3$.

- (b) State the coordinates of the corresponding point on the original curve $y = f(x)$. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 5 (a) Express $2x^2 - 8x + 14$ in the form $2[(x - a)^2 + b]$. [2]

.....

.....

.....

.....

.....

.....

.....

.....

The functions f and g are defined by

$$f(x) = x^2 \quad \text{for } x \in \mathbb{R},$$

$$g(x) = 2x^2 - 8x + 14 \quad \text{for } x \in \mathbb{R}.$$

- (b) Describe fully a sequence of transformations that maps the graph of $y = f(x)$ onto the graph of $y = g(x)$, making clear the order in which the transformations are applied. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 9 Functions f and g are both defined for $x \in \mathbb{R}$ and are given by

$$f(x) = x^2 - 4x + 9,$$

$$g(x) = 2x^2 + 4x + 12.$$

- (a) Express $f(x)$ in the form $(x - a)^2 + b$. [1]

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b) Express $g(x)$ in the form $2[(x + c)^2 + d]$. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) Express $g(x)$ in the form $kf(x + h)$, where k and h are integers.

[1]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (d) Describe fully the two transformations that have been combined to transform the graph of $y = f(x)$ to the graph of $y = g(x)$.

[4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 4 (a) The curve with equation $y = x^2 + 2x - 5$ is translated by $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$.

Find the equation of the translated curve, giving your answer in the form $y = ax^2 + bx + c$. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b) The curve with equation $y = x^2 + 2x - 5$ is transformed to a curve with equation $y = 4x^2 + 4x - 5$.

Describe fully the single transformation that has been applied. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 4** The transformation R denotes a reflection in the x -axis and the transformation T denotes a translation of $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$.

- (a)** Find the equation, $y = g(x)$, of the curve with equation $y = x^2$ after it has been transformed by the sequence of transformations R followed by T . [2]

.....

.....

.....

.....

.....

.....

- (b)** Find the equation, $y = h(x)$, of the curve with equation $y = x^2$ after it has been transformed by the sequence of transformations T followed by R . [2]

.....

.....

.....

.....

.....

.....

.....

- (c)** State fully the transformation that maps the curve $y = g(x)$ onto the curve $y = h(x)$. [2]

.....

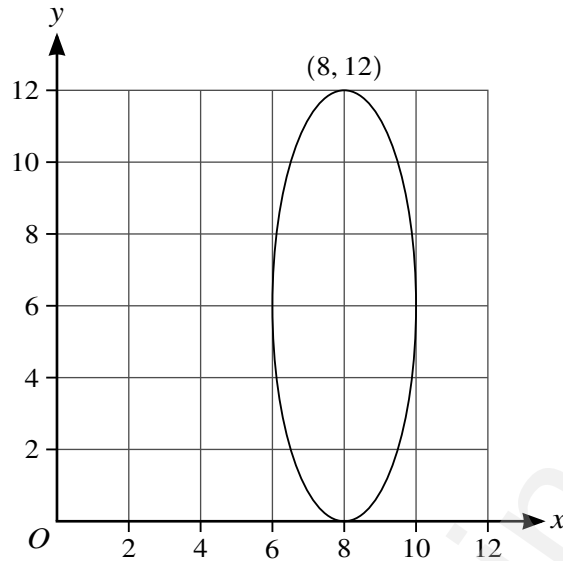
.....

.....

.....

.....

.....



The diagram shows a curve which has a maximum point at $(8, 12)$ and a minimum point at $(8, 0)$. The curve is the result of applying a combination of two transformations to a circle. The first transformation applied is a translation of $\begin{pmatrix} 7 \\ -3 \end{pmatrix}$. The second transformation applied is a stretch in the y -direction.

- (a) State the scale factor of the stretch. [1]

.....

.....

- (b) State the radius of the original circle. [1]

.....

.....

- (c) State the coordinates of the centre of the circle after the translation has been completed but before the stretch is applied. [2]

.....

.....

.....

- (d) State the coordinates of the centre of the original circle. [2]

.....

.....

.....