Transformations of Graphs

Question Paper

Course	Edexcel IGCSE Maths
Section	3. Sequences, Functions & Graphs
Topic	Transformations of Graphs
Difficulty	Hard

Time allowed: 60

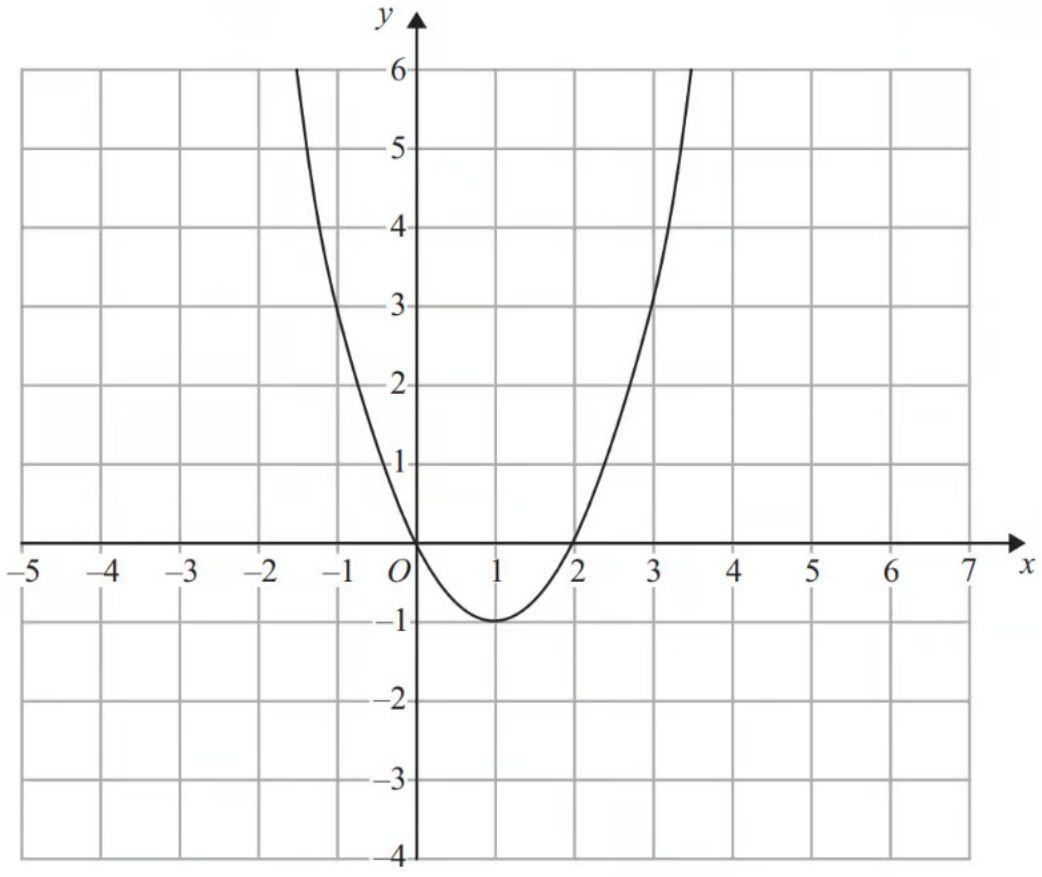
Score: /46

Percentage: /100

Question 1a

The graph of $y = \mathrm{f}(x)$ is shown on each of the grids.

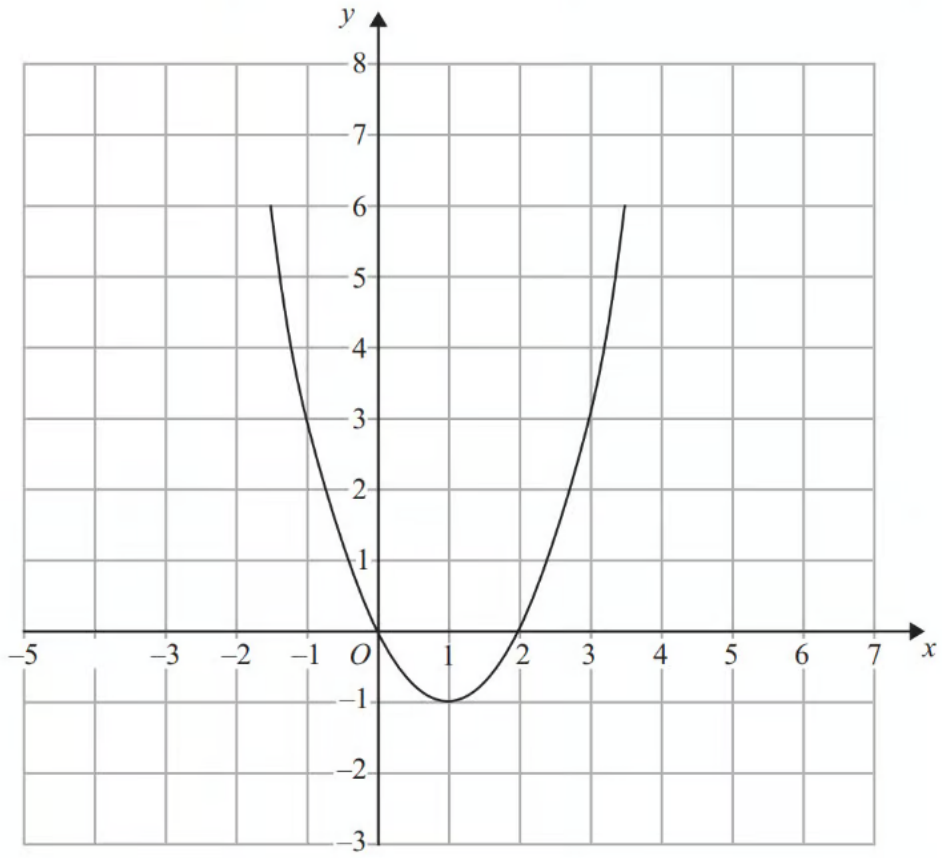
On this grid, sketch the graph of $y = \mathrm{f}(x - 3)$



[2 marks]

Question 1b

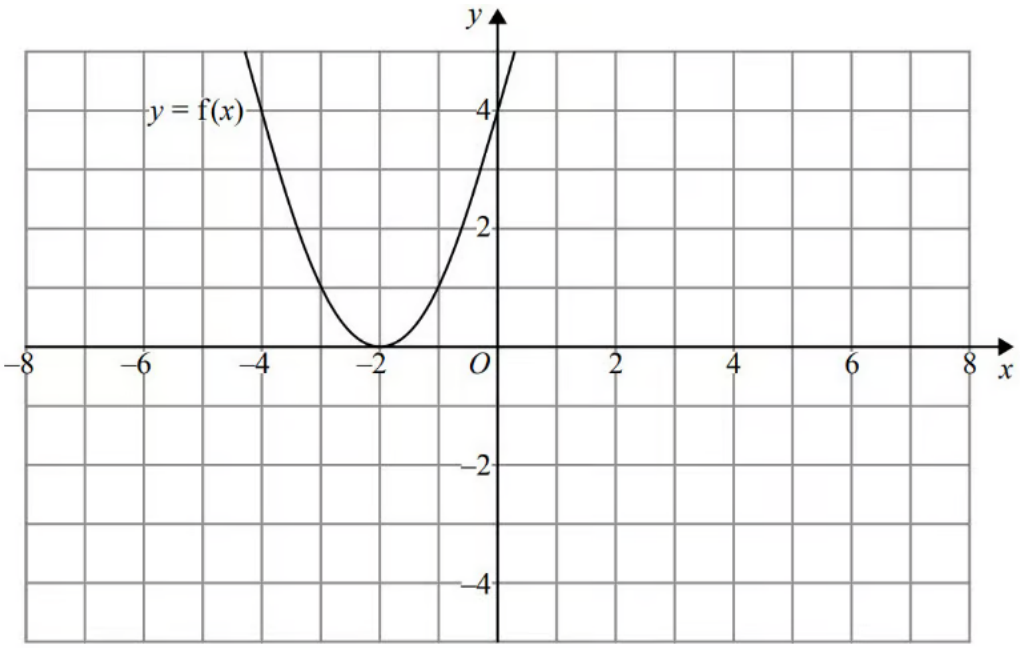
On this grid, sketch the graph of $y = f(-x) + 2$



[2 marks]

Question 2a

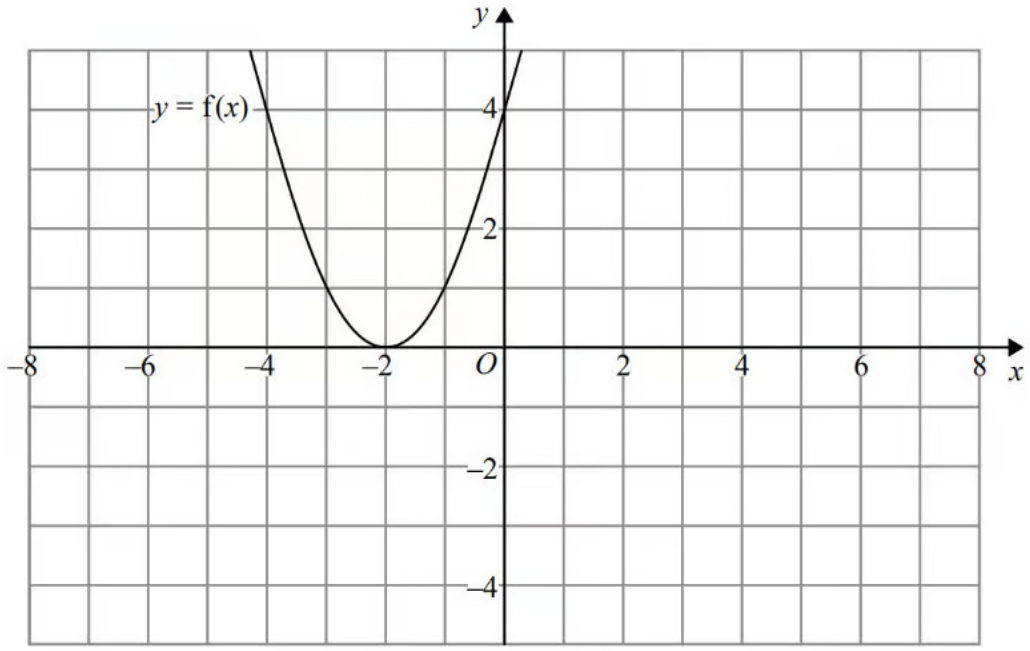
The graph of $y = f(x)$ is shown on both grids below



On the grid above, sketch the graph of $y = f(-x)$

[1 mark]

Question 2b



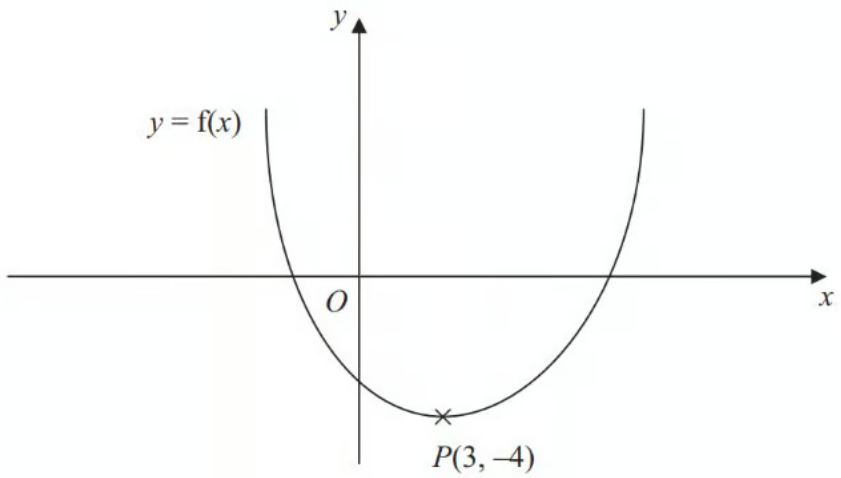
On this grid, sketch the graph of $y = -f(x) + 3$

[1 mark]

Question 3a

This is a sketch of the curve with the equation $y = \mathrm{f}(x)$.

The only minimum point of the curve is at $P(3, -4)$.



Write down the coordinates of the minimum point of the curve with the equation $y = \mathrm{f}(x-2)$

[2 marks]

Question 3b

Write down the coordinates of the minimum point of the curve with the equation $y = \mathrm{f}(x+5)+6$

[2 marks]

Question 4

The graph of $y = \mathrm{f}(x)$ is transformed to give the graph of $y = -\mathrm{f}(x+3)$
The point A on the graph of $y = \mathrm{f}(x)$ is mapped to the point P on the graph of $y = -\mathrm{f}(x+3)$

The coordinates of point A are $(9, 1)$
Find the coordinates of point P.

[2 marks]

Question 5

The graph of the curve C with equation $y = \mathrm{f}(x)$ is transformed to give the graph of the curve S with equation $y = \mathrm{f}(-x) - 3$

The point on C with coordinates $(7, 2)$ is mapped to the point Q on S.

Find the coordinates of Q.

[2 marks]

Question 6

The graph of $y = h(x)$ intersects the x-axis at two points.
The coordinates of the two points are (–1, 0) and (6, 0)

The graph of $y = h(x + a)$ passes through the point with coordinates (2, 0), where a is a constant.

Find the two possible values of a

[2 marks]

Question 7a

The curve C has equation $y = \mathrm{f}(x)$ where $\mathrm{f}(x) = 9 - 3(x + 2)^2$

The point A is the maximum point on $\mathbf{C}$.

Write down the coordinates of A.

[1 mark]

Question 7b

The curve $\mathbf{C}$ is transformed to the curve $\mathbf{S}$ by a translation of $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$

Find an equation for the curve $\mathbf{S}$.

[1 mark]

Question 7c

The curve $\mathbf{C}$ is transformed to the curve $\mathbf{T}$.
The curve $\mathbf{T}$ has equation $y = 3(x + 2)^2 - 9$

Describe fully the transformation that maps curve $\mathbf{C}$ onto curve $\mathbf{T}$.

[1 mark]

Question 8

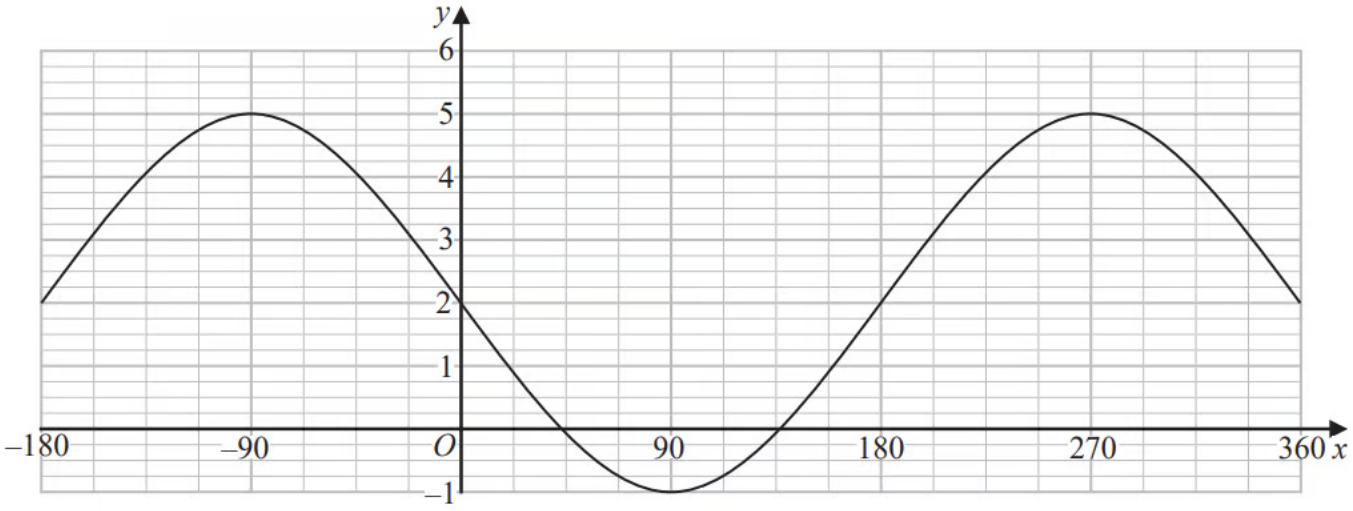
The curve $\mathbf{S}$ has equation $y = \mathrm{f}(x)$ where $\mathrm{f}(x) = x^2$
The curve $\mathbf{T}$ has equation $y = \mathrm{g}(x)$ where $\mathrm{g}(x) = 2x^2 - 12x + 13$

By writing $\mathrm{g}(x)$ in the form $a(x - b)^2 - c$, where a, b and c are constants,
describe fully a series of transformations that map the curve $\mathbf{S}$ onto the curve $\mathbf{T}$.

[4 marks]

Question 9

The graph of $y = a\cos(x - b)° + c$ for $-180 \leqslant x \leqslant 360$ is drawn on the grid below.



Find the value of a, the value of b and the value of c.

a = ...

b = ...

c = ...

[3 marks]

Question 10

The equation of a curve $\mathbf{C}$ is $y = x^2 + 3x + 4$

The curve $\mathbf{C}$ is transformed to curve $\mathbf{S}$ under the translation $\begin{pmatrix} 4 \\ 6 \end{pmatrix}$

Find an equation of curve $\mathbf{S}$.

You do need to simplify the equation.

[2 marks]

Question 11a

The function f(x) is defined as $f(x) = 3 - 8x - 2x^2$

Find the coordinates of the turning point on the graph of $y = f(x)$

[3 marks]

Question 11b

Using your result from part (a) write down the coordinates of the turning point on the following graphs:

(i)

$y = f(x) + 2$

[1]

(ii)

$y = f(x - 3)$

[1]

(iii)

$y = f(4x)$

[1]

(iv)

$y = -f(x)$

[1]

(v)

$y = 3f(x + 1)$

[2]

[6 marks]

Question 12

The graph of $y = x^3 + 6$ is translated 4 units to the right.

The translated graph has equation $y = \mathrm{f}(x)$

Work out $\mathrm{f}(x)$.

Give your answer in the form $x^3 + ax^2 + bx + c$ where a, b and c are integers.

[4 marks]

Question 13

Curve P has equation $y = 2(x - 1)^2 - 5$

Curve Q is a reflection in the y-axis of curve P.

Work out the equation of curve Q.

Give your answer in the form $y = ax^2 + bx + c$ where a, b and c are integers.

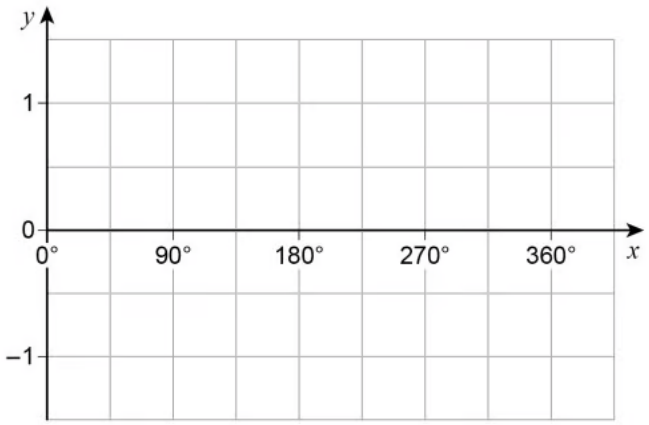
[3 marks]

Question 14

For all values of x

$$f(x) = \sin x$$
$$g(x) = x + 90$$

On the grid, draw the graph of the composite function $y = fg(x)$ for $0° \leqslant x \leqslant 360°$



[2 marks]