Name: _____

IGCSE (9–1) Maths new topics: Transformations of functions

Date:

Time: 40 minutes

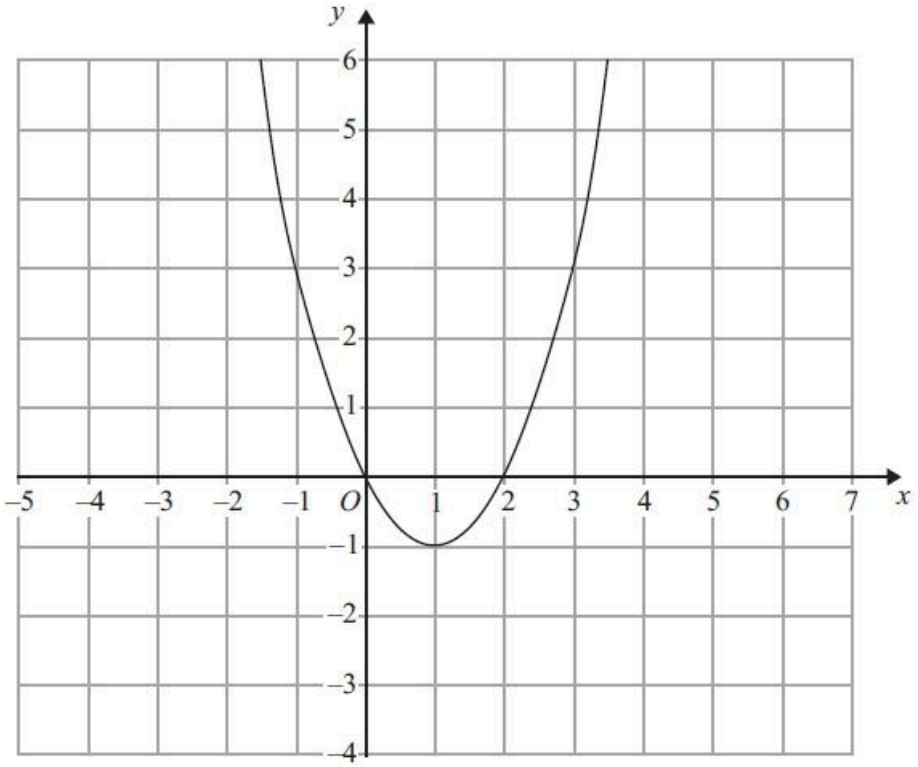
Total marks available: 34

Total marks achieved: _____

[GCSE]

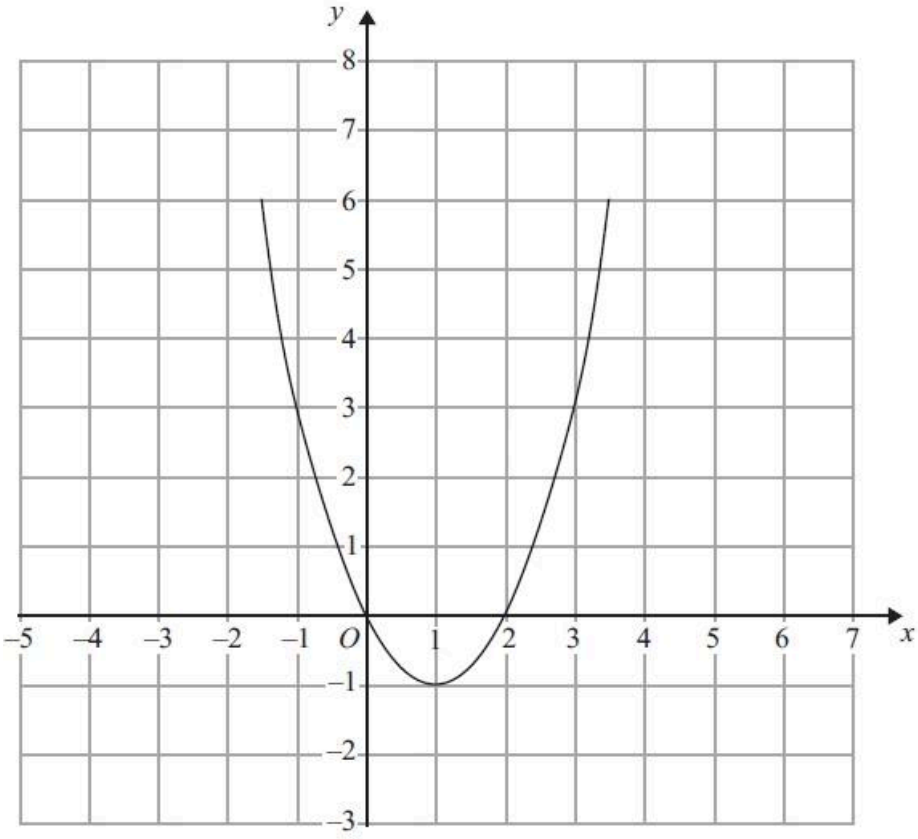
Q1. The graph of $y = f(x)$ is shown on each of the grids.

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



(2)

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

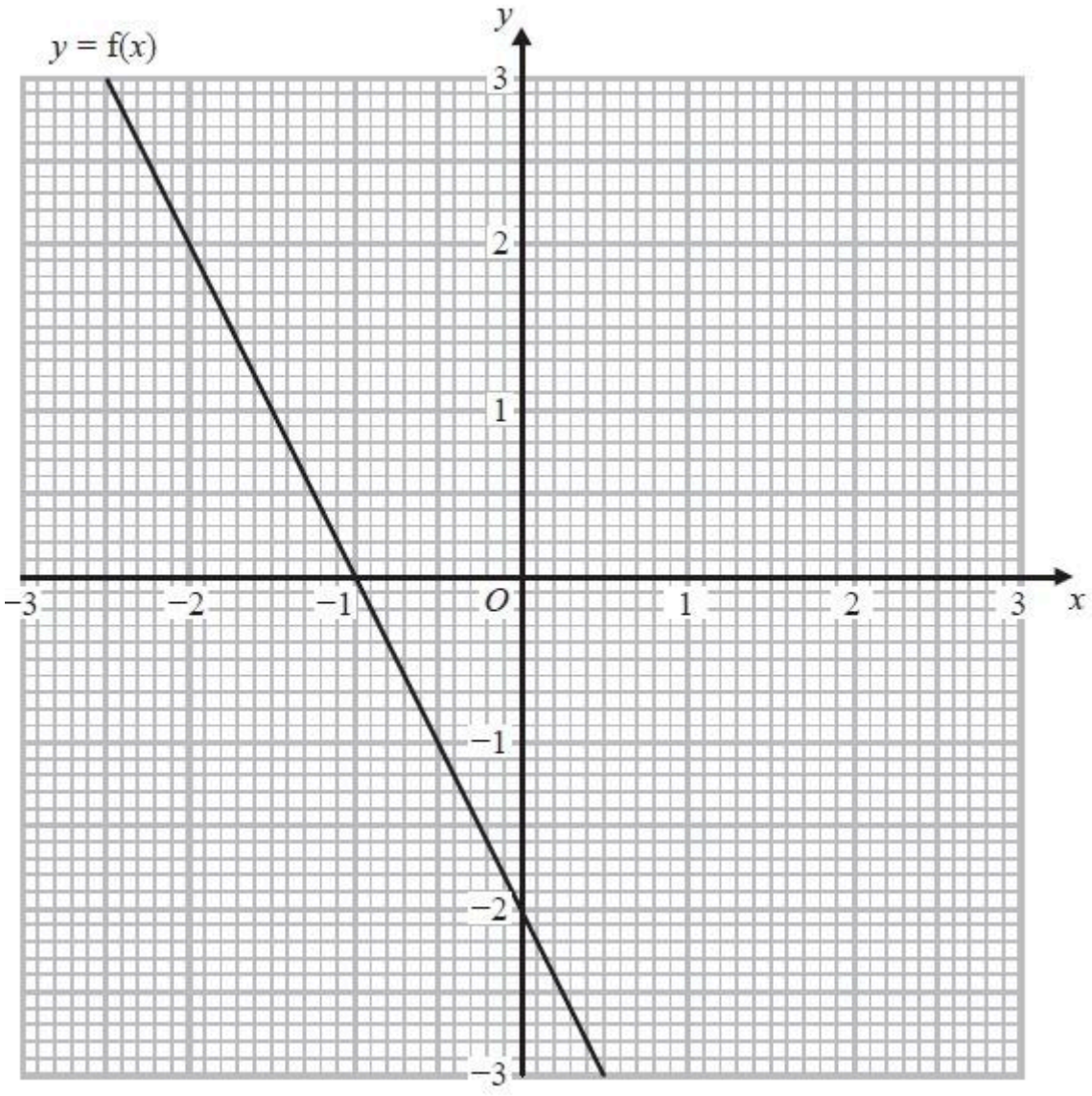


(2)

(Total 4 marks)

[GCSE]

Q2. Here is the graph of $y = f(x)$.



(*a*) Write down the coordinates of the point where the graph of $y = \frac{1}{2}f(x)$ meets the *y*-axis.

(..... , ...)

(1)

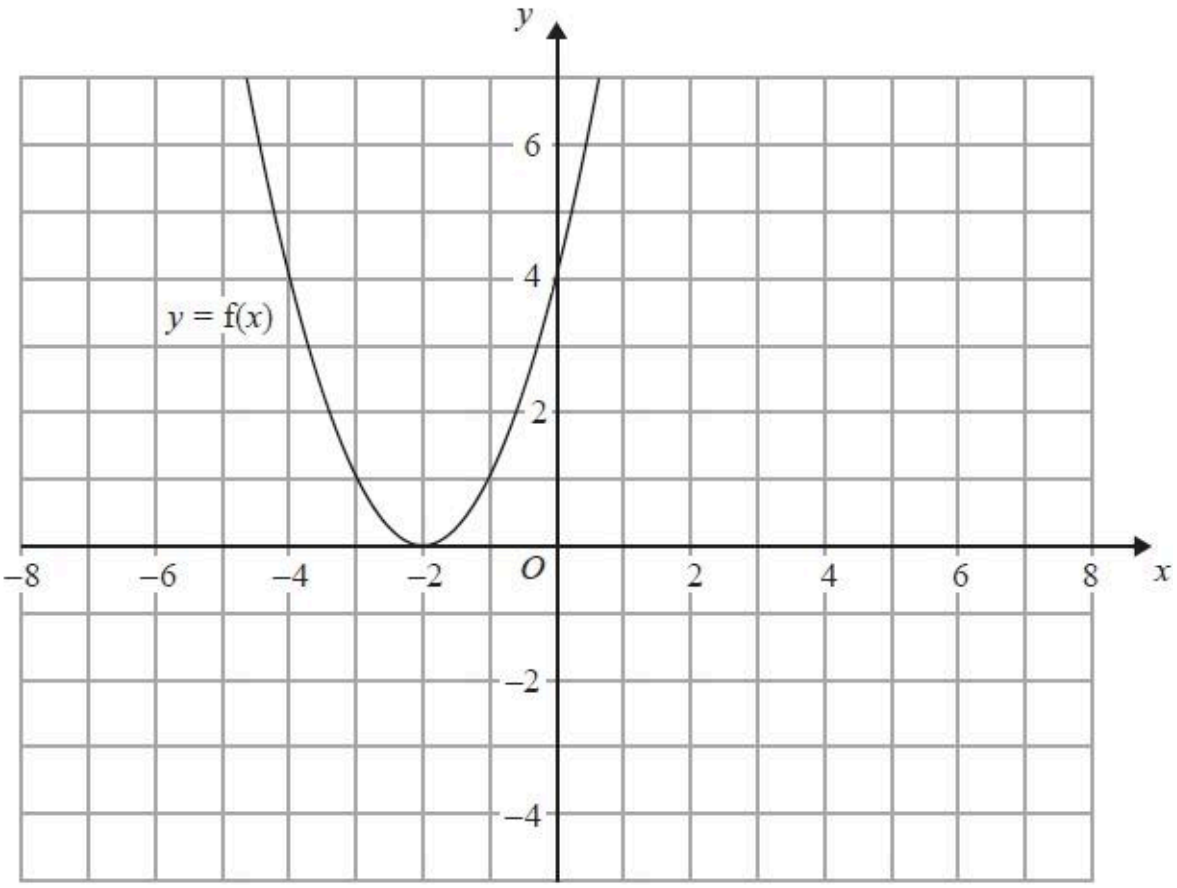
(*b*) On the grid, draw the graph of $y = f(x - 1)$.

(2)

(Total 3 marks)

[GCSE]

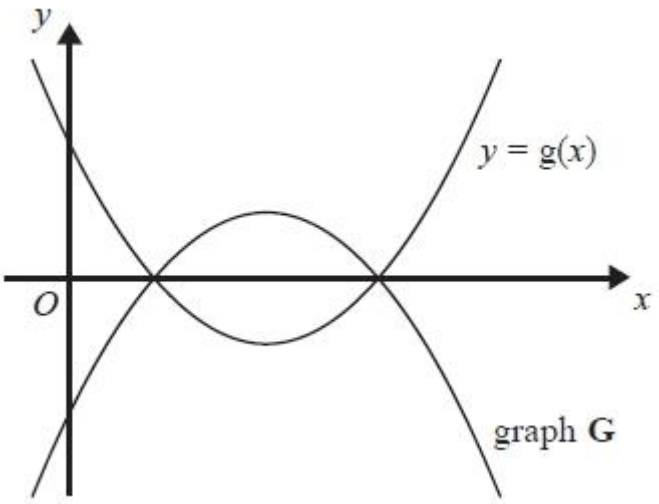
Q3. The graph of $y = f(x)$ is shown on the grid.



(*a*) On the grid above, sketch the graph of $y = f(x + 3)$

(2)

The graph of $y = g(x)$ is shown below.



The graph **G** is the reflection of $y = g(x)$ in the x-axis.

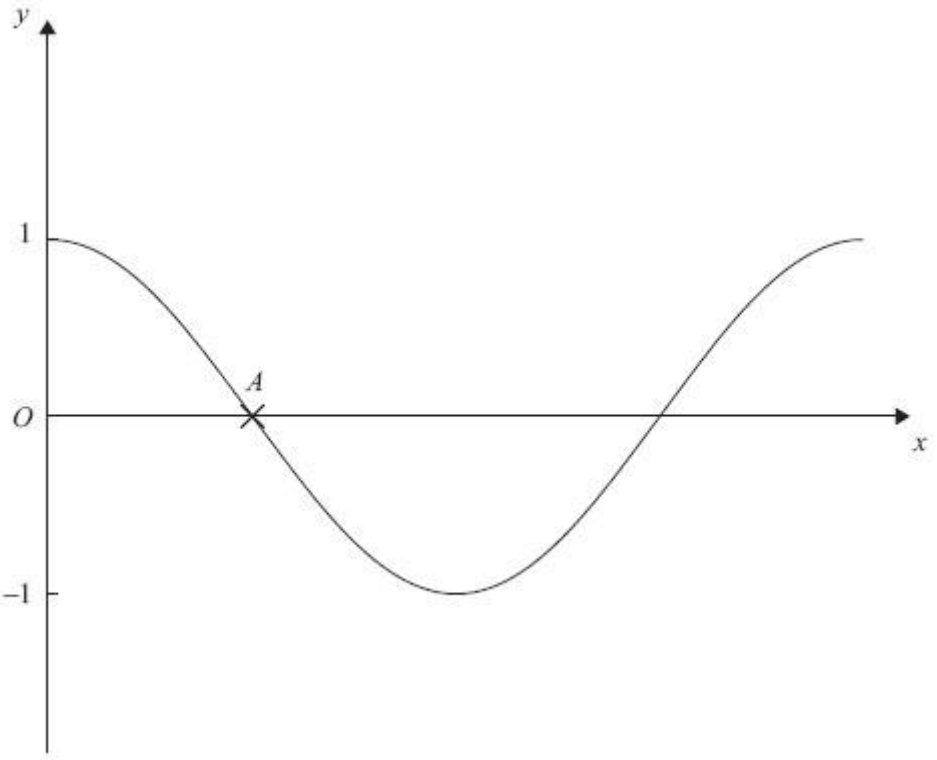
(*b*) Write down an equation of graph **G**.

(1)

(Total 3 marks)

[GCSE]

Q4. The diagram shows a sketch of the graph of $y = \cos x°$



(*a*) Write down the coordinates of the point *A*.

(1)

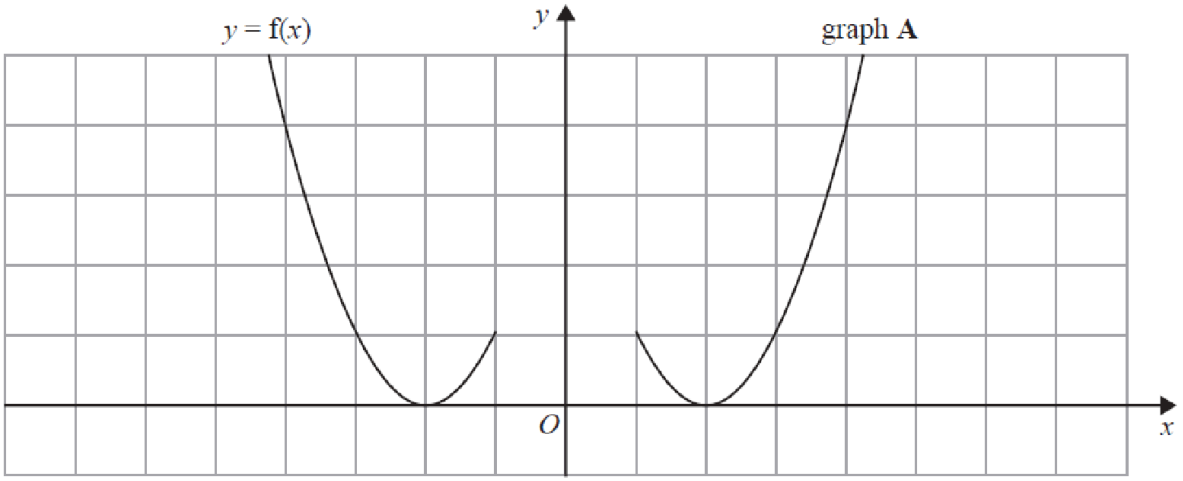
(*b*) On the same diagram, draw a sketch of the graph of $y = 2 \cos x°$

(1)

(Total 2 marks)

[GCSE]

Q5. The graph of $y = f(x)$ is shown on the grid.

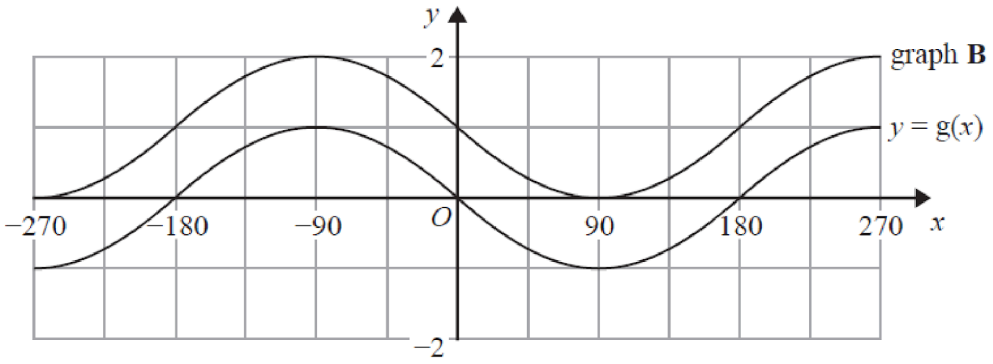


Graph **A** is a reflection of the graph of $y = f(x)$.

(a) Write down the equation of graph **A**.

(1)

The graph of $y = g(x)$ is shown on the grid.

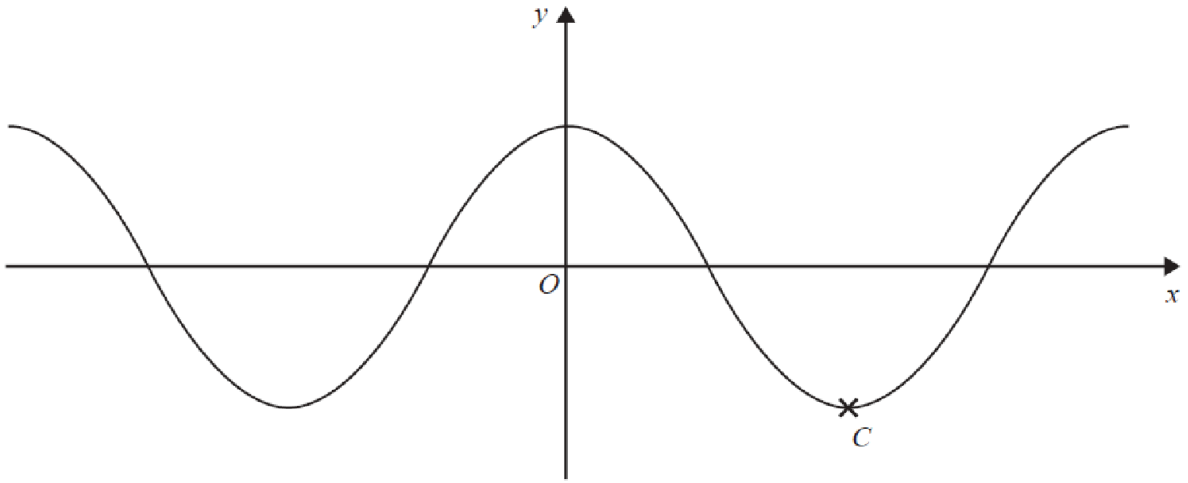


Graph **B** is a translation of $y = g(x)$.

(b) Write down the equation of graph **B**.

(1)

The graph of $y = \cos x°$ is shown.



(*c*) Write down the coordinates of the point marked *C*.

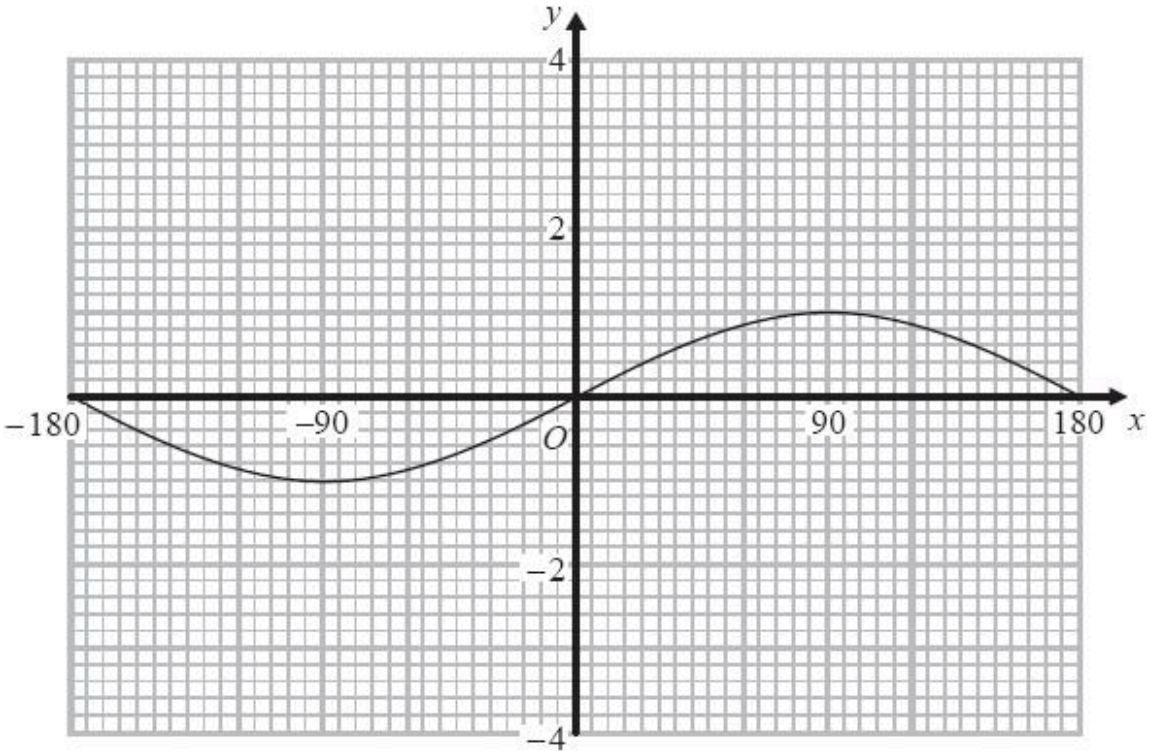
(..... , ...)

(1)

(Total 3 marks)

[GCSE]

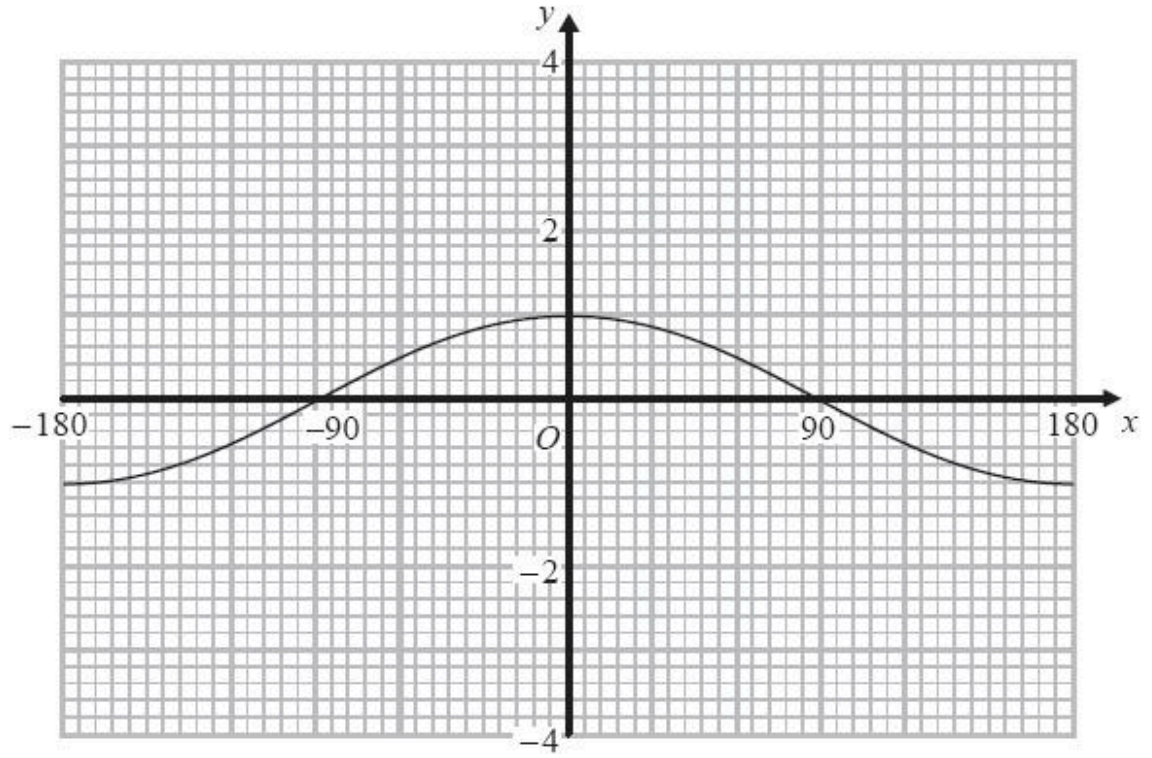
Q6. Here is the graph of $y = \sin x°$ for $-180 \leq x \leq 180$



(*a*) On the grid above, sketch the graph of $y = \sin x° + 2$ for $-180 \leq x \leq 180$

(2)

Here is the graph of $y = \cos x°$ for $-180 \leq x \leq 180$



(*b*) On the grid above, sketch the graph of $y = -2 \cos x°$ for $-180 \leq x \leq 180$

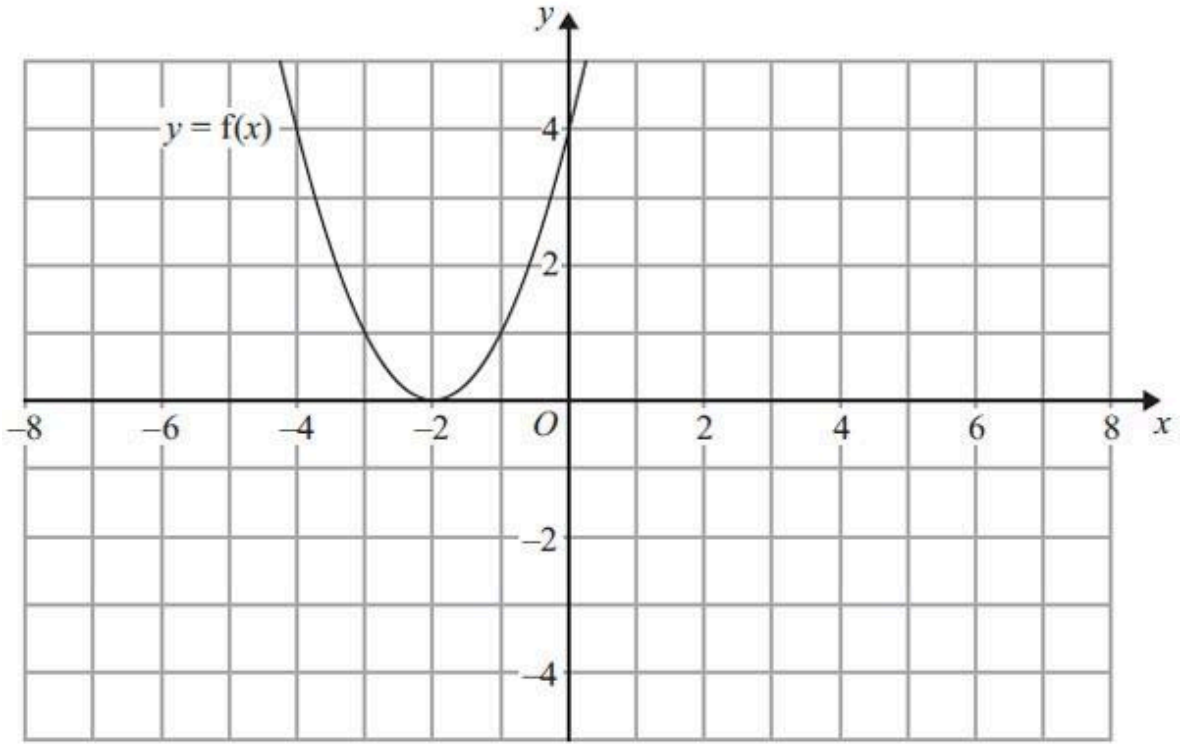
(2)

(Total 4 marks)

[GCSE]

Q7. $y = f(x)$

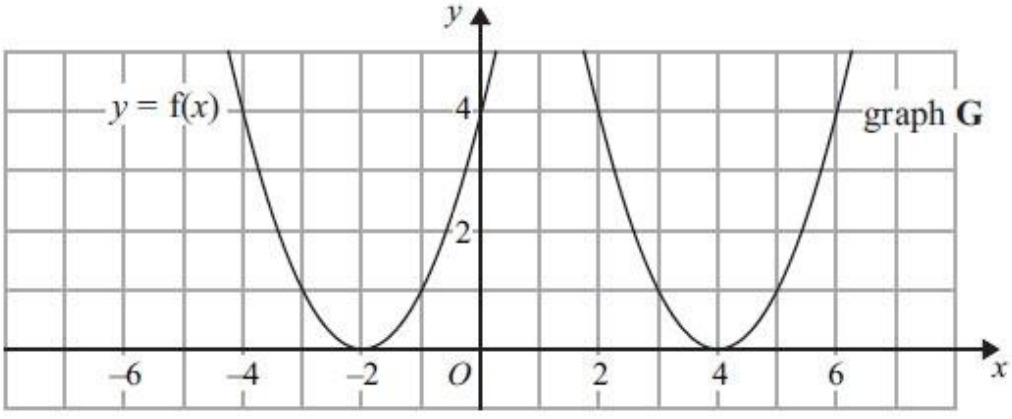
The graph of $y = f(x)$ is shown on the grid.



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

(2)

The graph of $y = f(x)$ is shown on the grid.



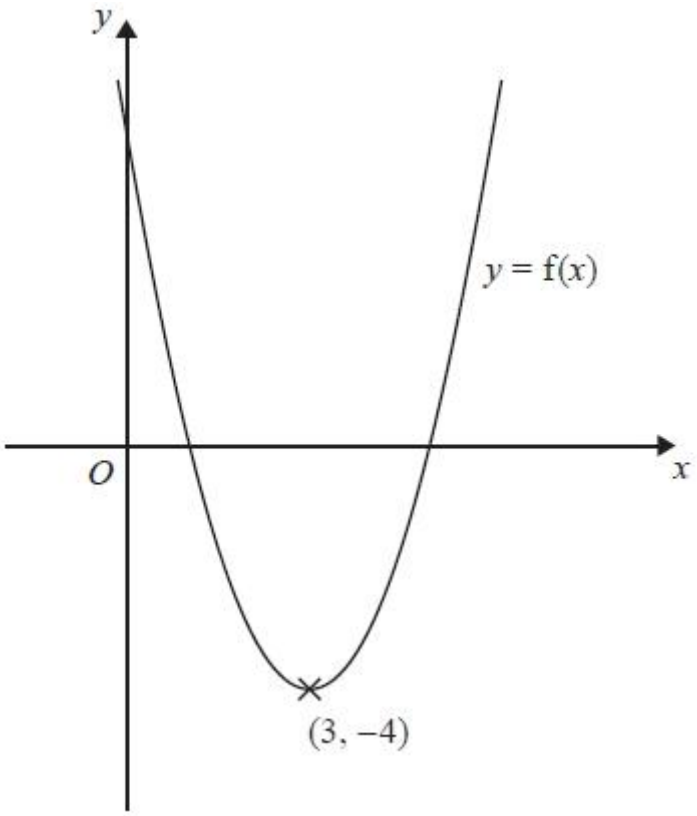
The graph **G** is a translation of the graph of $y = f(x)$.

(*b*) Write down the equation of graph **G**.

(2)

(Total 3 marks)

[GCSE]
Q8.



The diagram shows part of the curve with equation $y = f(x)$.
The coordinates of the minimum point of this curve are $(3, -4)$

Write down the coordinates of the minimum point of the curve with equation

(i) $y = f(x) + 3$

(..... , ...)

(ii) $y = f(2x)$

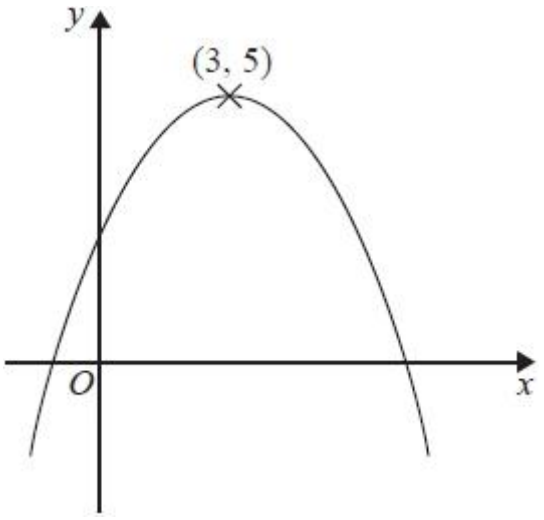
(..... , ...)

(iii) $y = f(-x)$

(..... , ...)

(Total 3 marks)

Q9.



The diagram shows part of the curve with equation $y = f(x)$.
The coordinates of the maximum point of the curve are (3, 5).

(*a*) Write down the coordinates of the maximum point of the curve with equation

(i) $y = f(x + 3)$

(..... , ...)

(ii) $y = 2f(x)$

(..... , ...)

(iii) $y = f(3x)$

(..... , ...)

(3)

The curve with equation $y = f(x)$ is transformed to give the curve with equation $y = f(x) - 4$

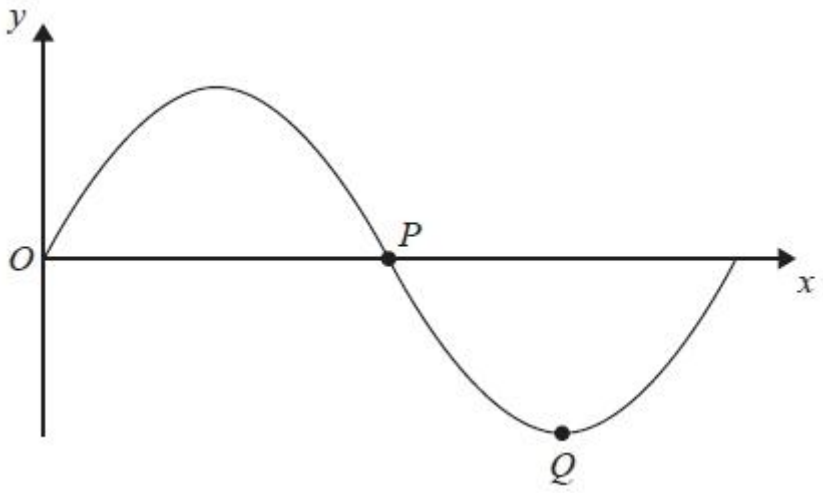
(*b*) Describe the transformation.

(1)

(Total 4 marks)

[GCSE]

Q10. The diagram shows part of a sketch of the curve $y = \sin x°$.



(*a*) Write down the coordinates of the point *P*.

(....., ...)

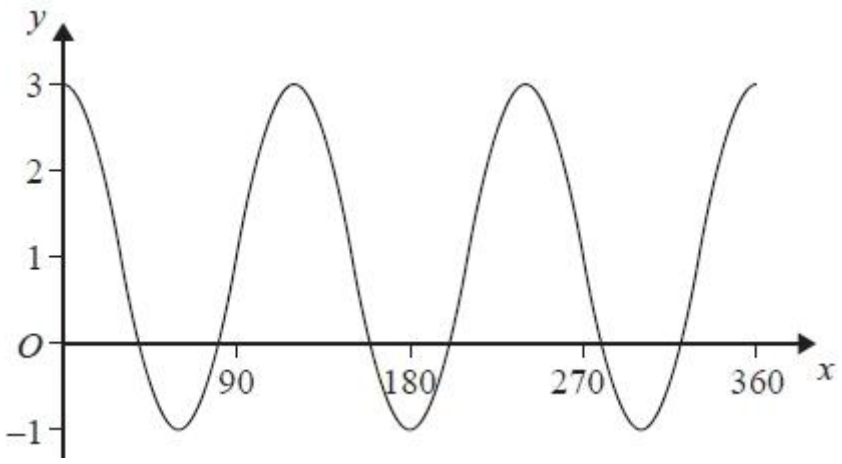
(1)

(*b*) Write down the coordinates of the point *Q*.

(....., ...)

(1)

Here is a sketch of the curve $y = a \cos bx° + c$, $0 \leq x \leq 360$



(*c*) Find the values of *a*, *b* and *c*.

a =.....

b =.....

c =.....

(3)

(Total 5 marks)

Mark Scheme

Q1.

Question		Working	Answer	Mark	Notes
	(a)		Parabola through (4, –1), (2, 3), (6, 3) (3, 0) (5, 0)	2	B2 for a parabola with min (4, –1), through (2, 3), (6, 3),(3, 0), (5, 0) (B1 for a parabola with min (4, –1) **or** a parabola through (2, 3) and (6, 3) **or** a parabola through (3, 0) and (5, 0) **or** a translation of the given parabola along the *x*-axis by any value other than +3 **with** the points (–1, 3) (0, 0) (1, –1) (2, 0) (3, 3) all translated by the same amount)
	(b)		Parabola through (1, –2), (0, 0), (2, 0)	2	B2 parabola with min (1, –2), through (0, 0) and (2, 0) (B1 parabola with min (1, –2) **or** parabola through (0, 0), (2, 0) (-1, 6) and (3, 6))

Q2.

PAPER: 5MB3H_01					
Question		Working	Answer	Mark	Notes
	(a)		(0,–1)	1	B1 cao
	(b)		Straight line drawn	2	M1 for a horizontal translation of 1 unit. A1 for straight line drawn parallel to $y = f(x)$ through O from (–1.5, 3) to (1.5, –3)

Q3.

5MB3H/01 June 2015				
Question	Working	Answer	Mark	Notes
(a)		Correct graph	2	M1 for any translation along x axis A1 correct position
(b)		$y = -g(x)$	1	B1 for $y = -g(x)$ oe from correct interpretation of diagram

Q4.

		Working	Answer	Mark	Notes
	(a)		(90, 0)	1	B1 for (90, 0) (condone (π½, 0))
	(b)		Correct graph	1	B1 for graph through (0, 2) (90, 0) (180, -2) (270, 0) (360, 2) professional judgement

Q5.

Mock Paper 1MA1: 1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
	(a)		$y = f(-x)$	1	B1 cao
	(b)		$y = g(x) + 1$	1	B1 cao
	(c)		(180,−1)	1	B1 cao

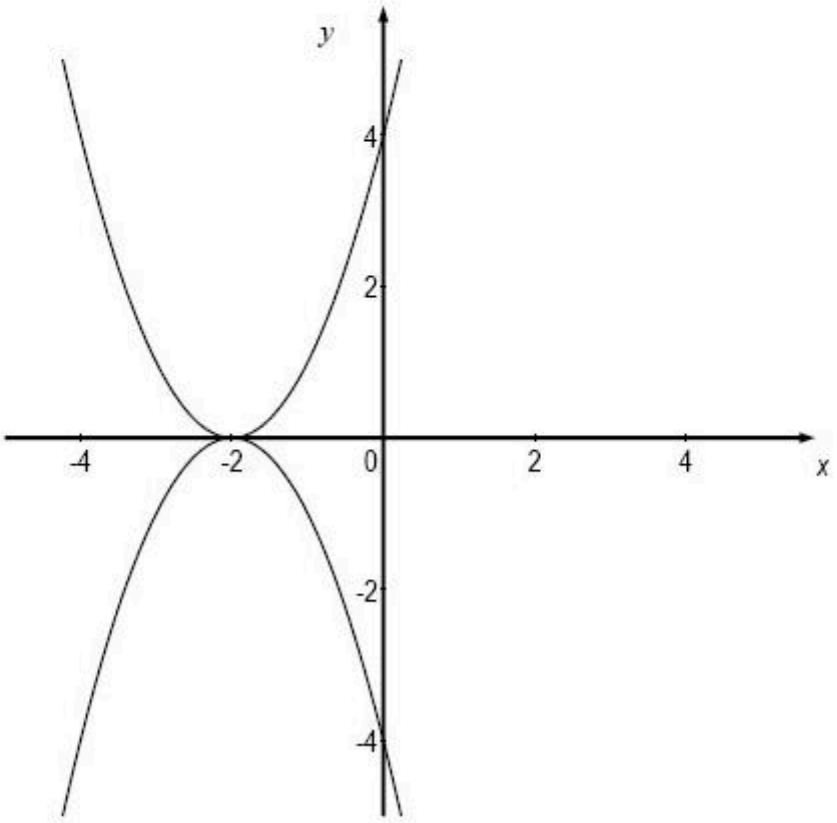
Q6.

Question		Working	Answer	Mark	Notes
	(a)		Graph drawn	2	B2 correct graph drawn (B1 for a graph translated up/down)
	(b)		Graph drawn	2	B2 for correct graph drawn (B1 for a graph reflected in the x axis or stretched by sf 2 parallel to the y axis)

Q7.

		Working	Answer	Mark	Notes
	(a)		sketch		M1 for inverting the parabola, so maximum is at (–2, 0) A1 for parabola passing through all three of the points (–2, 0), (0, –4), (–4, –4)
	(b)		$y = f(x - 6)$	1	B1 for $y = f(x - 6)$ or $y = (x - 4)^2$ oe

(a)



Q8.

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
	(i)		(3, −1)	3	B1 cao
	(ii)		(1.5, −4)		B1 for (1.5, −4) accept 1.5 or $1\frac{1}{2}$ or $\frac{3}{2}$ for x coordinate
	(iii)		(−3, −4)		B1 cao

Q9.

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
	(a) (i)		(0, 5)	3	B1 cao
	(ii)		(3, 10)		B1 cao
	(iii)		(1, 5)		B1 cao
	(b)		Translation of $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$ oe	1	B1 for a correct transformation, eg. translation of $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$ or translation of 4 units in the negative y-direction, oe.

Q10.

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
	(a)		180, 0	1	B1 for 180, 0 Accept π, 0
	(b)		270, –1	1	B1 for 270, –1 accept $\frac{3\pi}{2}$, –1
	(c)		$a = 2$ $b = 3$ $c = 1$	3	B1 cao B1 cao B1 cao