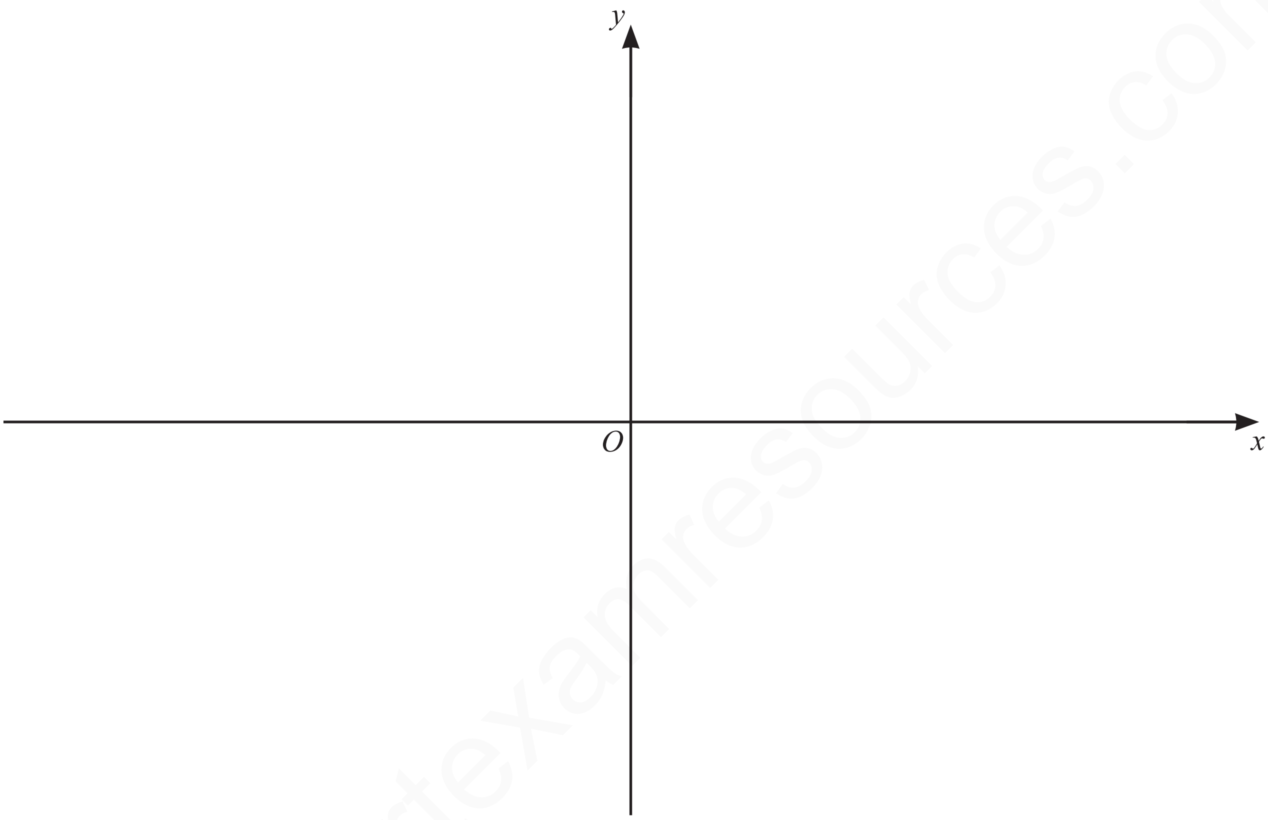
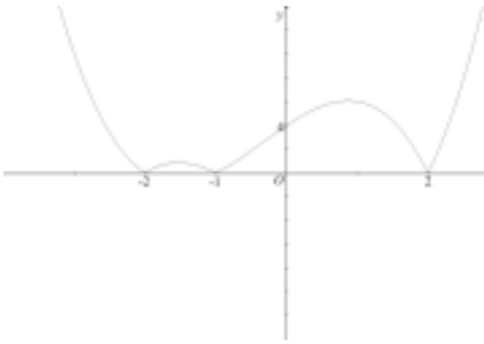
FUNCTIONS-SET-7-QP-MS

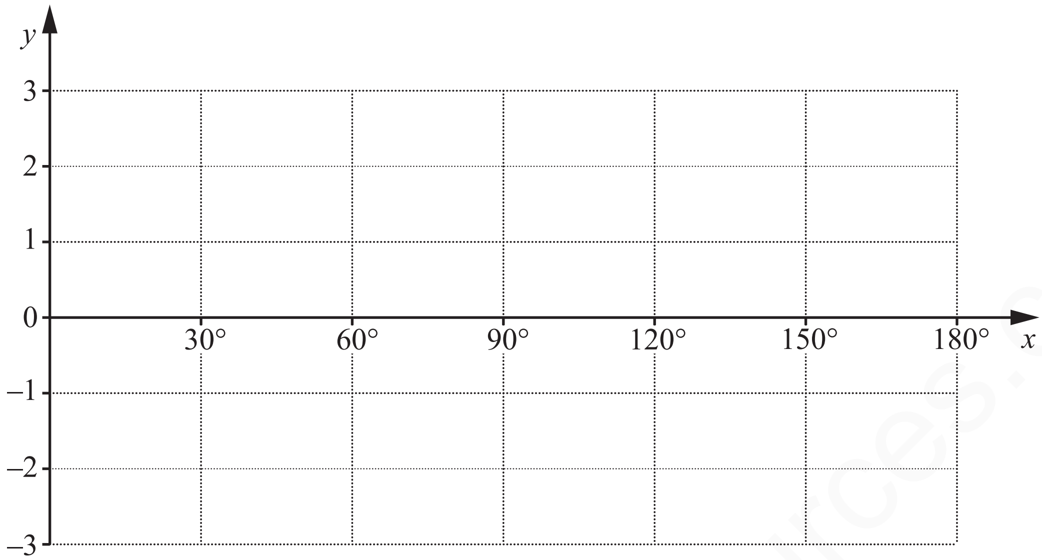
1 On the axes below, sketch the graph of $y = |(x-2)(x+1)(x+2)|$ showing the coordinates of the points where the curve meets the axes. [3]



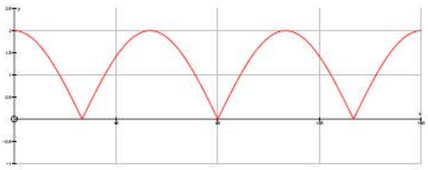
MARKING SCHEME

1		**B1**	Shape
		B1	Correct x-coordinates
		B1	Correct y-coordinate and max in first quadrant

2 On the axes below, sketch the graph of $y = |2\cos 3x|$ for $0 \leqslant x \leqslant 180°$. [3]

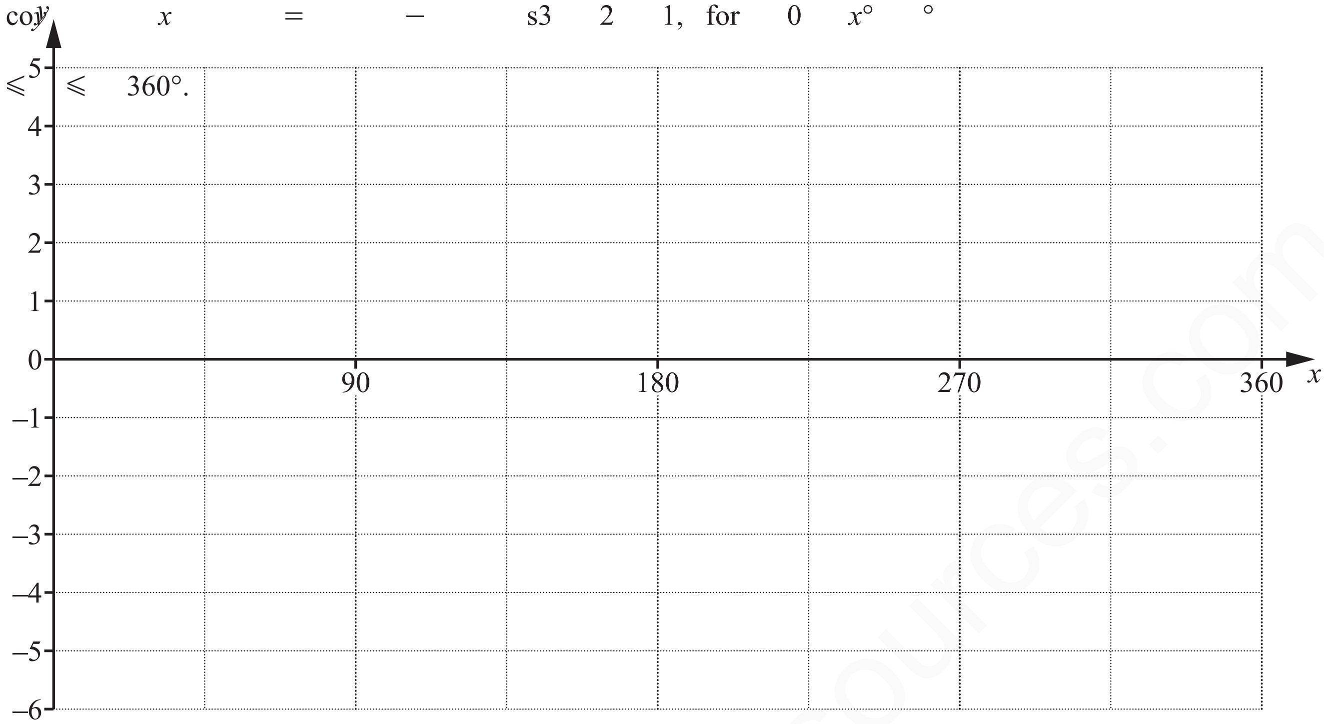


MARKING SCHEME

		**B1** **B1** **B1**	for symmetrical shape as in the diagram with curved maxima of equal height and cusps on the x-axis for a complete 'curve' with all low points on the x-axis and all high points on $y = 2$ for a complete 'curve' meeting the x-axis at $x = 30°,\ 90°,\ 150°$ only.

3 **(a)** On the axes below, sketch the graph of

$y = 2\cos 3x - 1$, for $0° \leqslant x \leqslant 360°$.



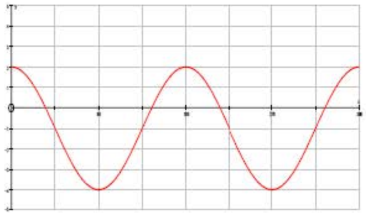
[3]

(b) Given that $y = 4\sin 6x$, write down

(i) the amplitude of y, [1]

(ii) the period of y. [1]

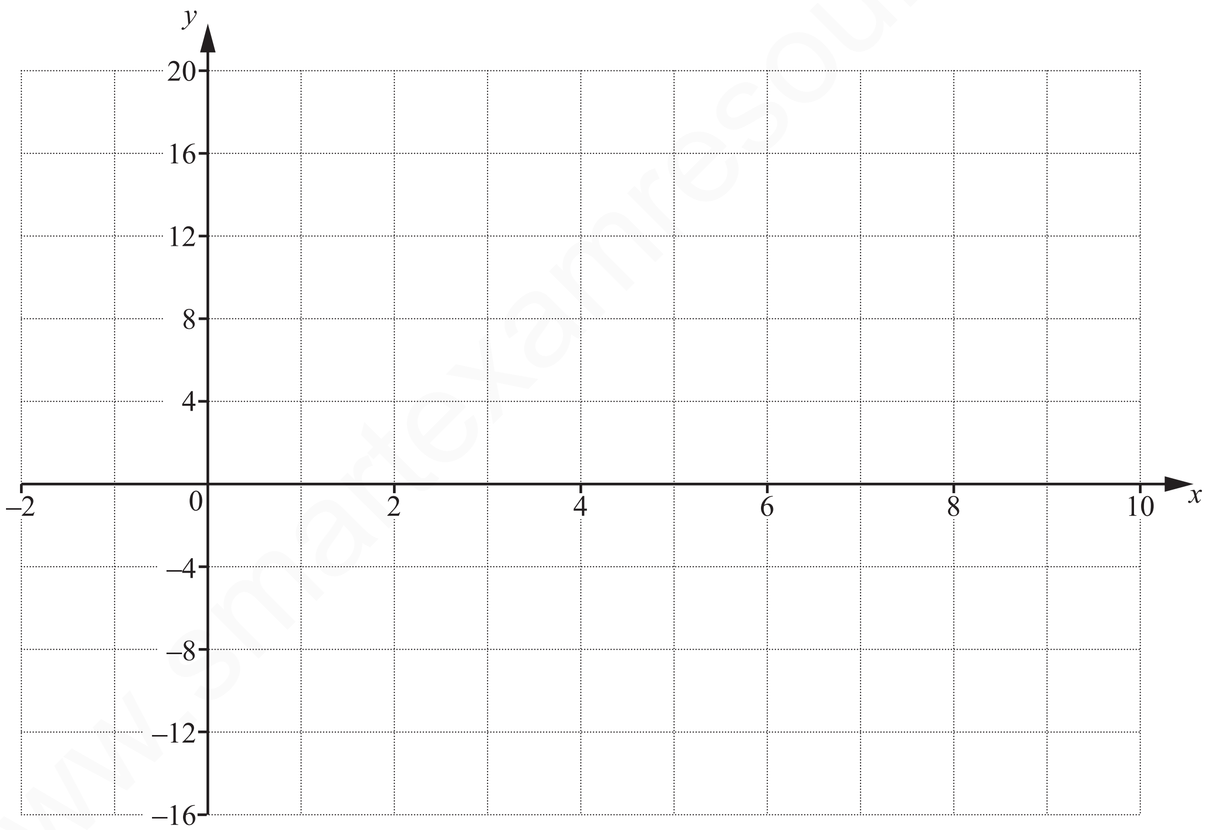
MARKING SCHEME

(a)		**B3**	**B1** for 2 cycles, one max and 2 min points in the correct places and up to a max at each end **B1** for going between 2 and –4 **B1** for starting at $(0, 2)$ and finishing at $(360, 2)$
(b)(i)	4	**B1**	
(b)(ii)	$60°$ or $\frac{\pi}{3}$	**B1**	

4 **(i)** Write $x^2 - 9x + 8$ in the form $(x-p)^2 - q$, where p and q are constants. [2]

(ii) Hence write down the coordinates of the minimum point on the curve $y = x^2 - 9x + 8$. [1]

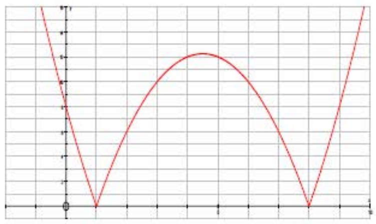
(iii) On the axes below, sketch the graph of $y = |x^2 - 9x + 8|$, showing the coordinates of the points where the curve meets the coordinate axes.



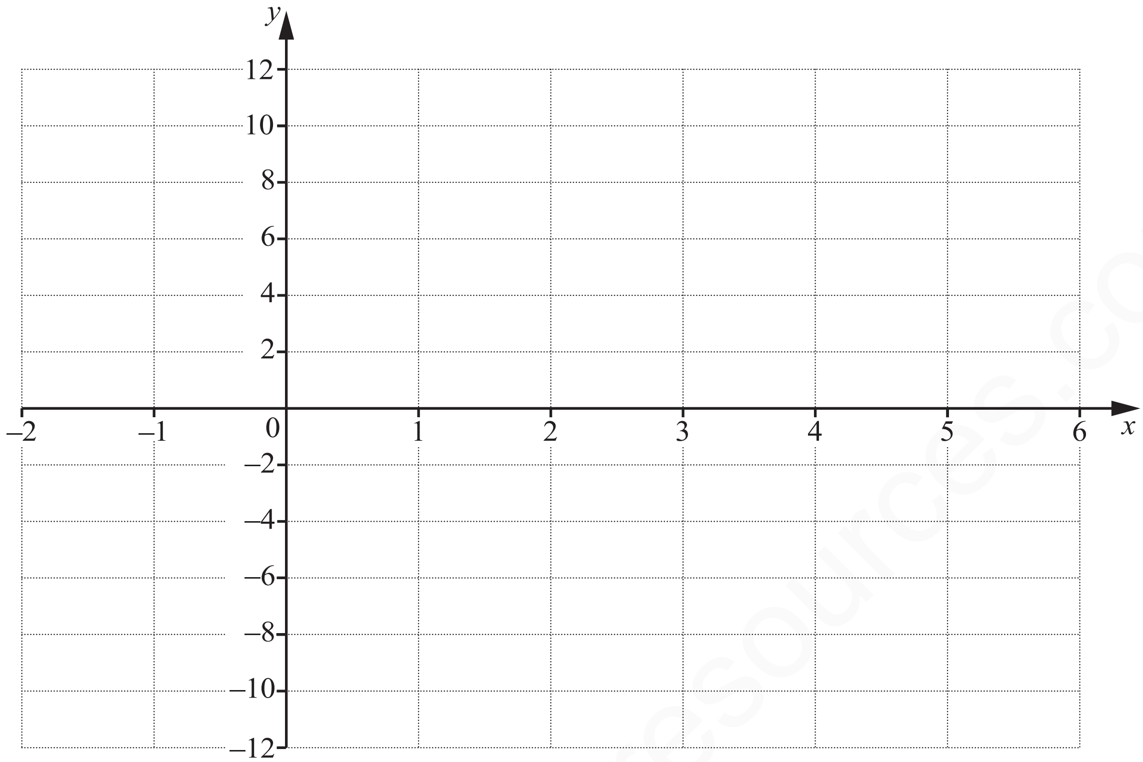
[3]

(iv) Write down the value of k for which $|x^2 - 9x + 8| = k$ has exactly 3 solutions. [1]

MARKING SCHEME

(i)	$\left(x-\frac{9}{2}\right)^2-\frac{49}{4}$	**B2**	**B1** for $\frac{9}{2}$ or $\frac{49}{4}$
(ii)	$\left(\frac{9}{2}, -\frac{49}{4}\right)$	**B1**	**FT** *their p* and *q*
(iii)		**B3**	**B1** for shape **B1** for cusps at $(1, 0)$ and $(8, 0)$ **B1** for all correct, passing through $(0, 8)$ with maximum in correct position
(iv)	$\frac{49}{4}$	**B1**	**FT** *their q*

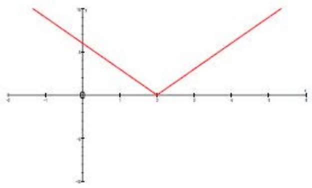
5 **(i)** On the axes below, sketch the graph of $y = |6-3x|$, showing the coordinates of the points where the graph meets the coordinate axes. [2]



(ii) Solve $|6-3x| = 2$. [3]

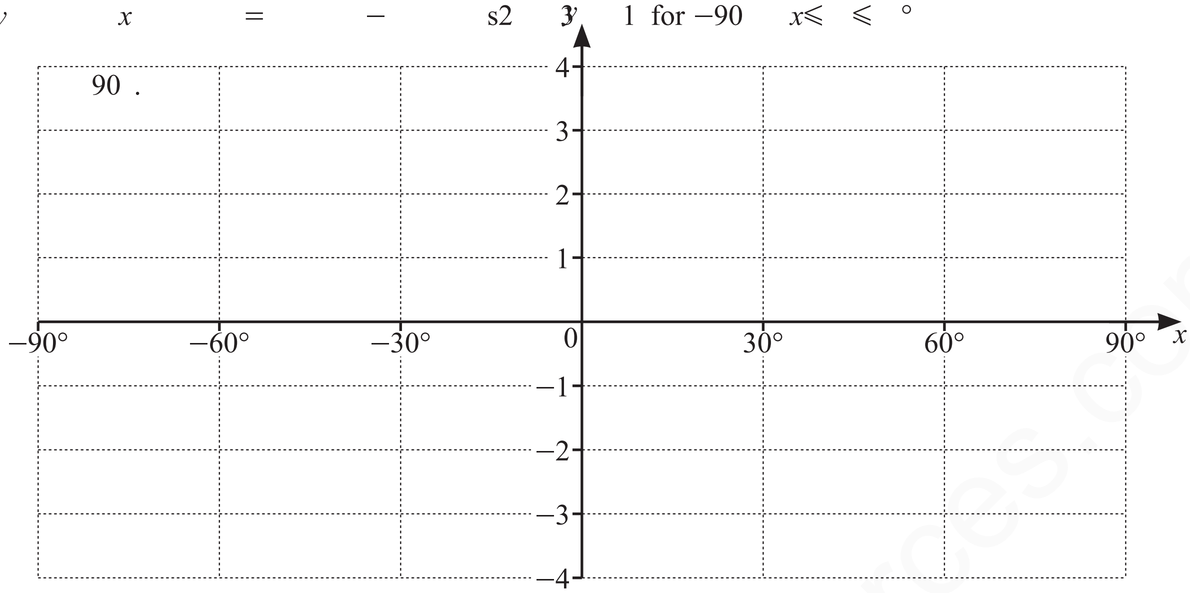
(iii) Hence find the values of x for which $|6-3x| > 2$. [1]

MARKING SCHEME

(i)		**B2**	**B1** for correct shape with vertex at $(2,0)$ **Dep B1** for passing through or starting at $(0,6)$
(ii)	**Either** $6-3x=2$ $x=\frac{4}{3}$	**B1**	For $x=\frac{4}{3}$
	$6-3x=-2$	**M1**	For considering – 2
	$x=\frac{8}{3}$	**A1**	
	Or $9x^2-36x+32=0$	**M1**	For squaring each side and attempt to solve a 3 term quadratic = 0
	$x=\frac{4}{3}$	**A1**	
	$x=\frac{8}{3}$	**A1**	
(iii)	$x<\frac{4}{3},\ x>\frac{8}{3}$	**B1**	**FT** on *their* solutions in part **(ii)**, must both be positive and written as 2 separate statements

6 **(i)** On the axes below, sketch the graph of

$y = 2\cos 3x - 1$ for $-90° \leqslant x \leqslant 90°$.

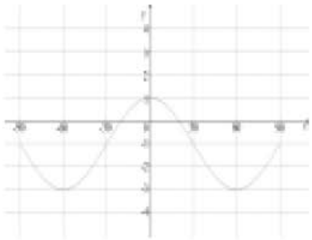


[3]

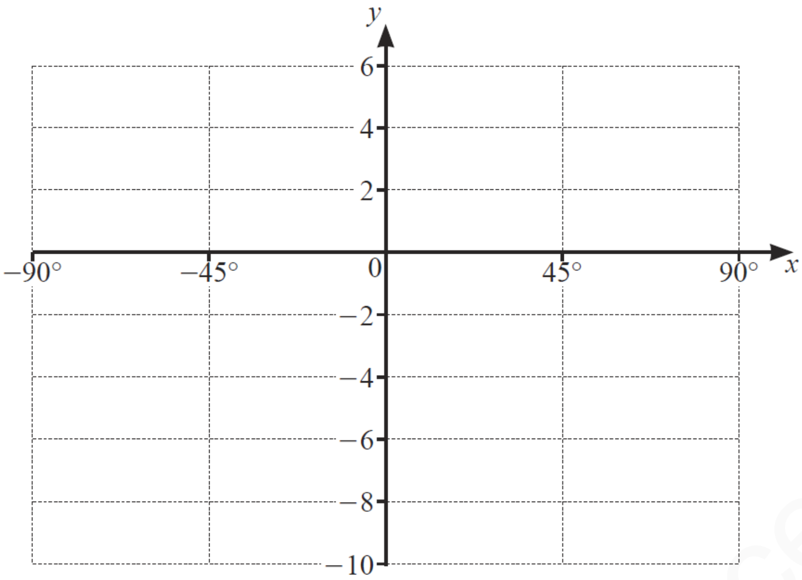
(ii) Write down the amplitude of $2\cos 3x - 1$. [1]

(iii) Write down the period of $2\cos 3x - 1$. [1]

MARKING SCHEME

(i)		**B3**	**B1** for y intercept $(0,1)$, must have a graph **B1** for starting and finishing at $(\pm 90, -1)$ **B1** for all correct, must be attempt at a curve passing through $(\pm 30, -1)$ and $(\pm 60, -3)$
(ii)	2	**B1**	
(iii)	$120°$ or $\frac{2\pi}{3}$	**B1**	

7 **(i)** On the axes below, sketch the graph of $y = 5\cos 4x - 3$ for $-90° \leqslant x \leqslant 90°$.

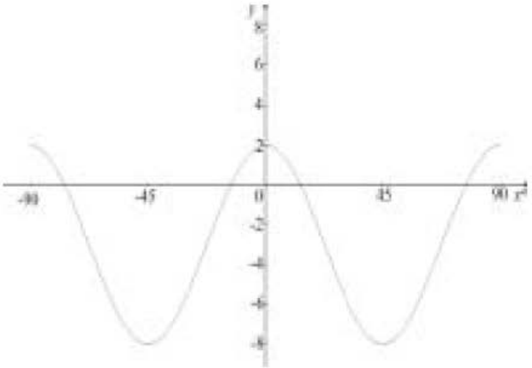


[4]

(ii) Write down the amplitude of y. [1]

(iii) Write down the period of y. [1]

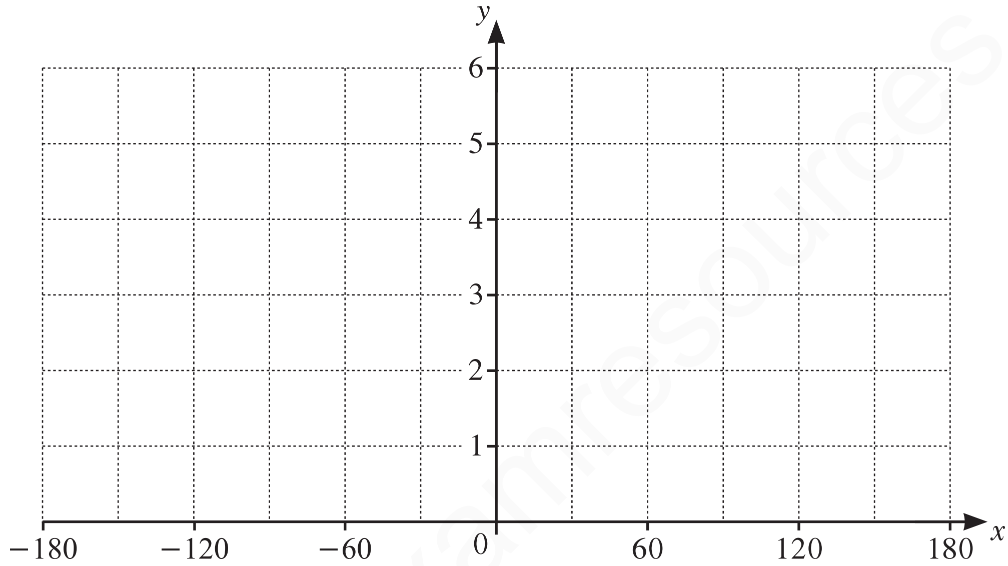
MARKING SCHEME

(i)		**B4**	**B1** for a maximum at $(0, 2)$ **B1** for minimums at $y = -8$ and no other minimums **B1** for starting at $(-90°, 2)$ and finishing at $(90°, 2)$ **B1** for a fully correct curve with correct shape, particularly at end points, that has earned all three previous B marks.
(ii)	5	**B1**	
(iii)	90°	**B1**	

8 **(a)** Write down the amplitude of $1+4\cos\left(\frac{x}{3}\right)$. [1]

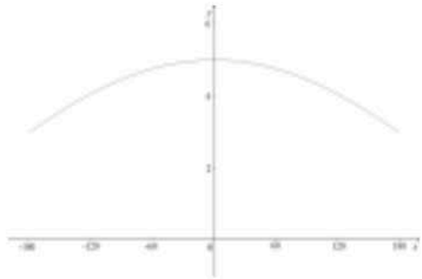
(b) Write down the period of $1+4\cos\left(\frac{x}{3}\right)$. [1]

(c) On the axes below, sketch the graph of $y=1+4\cos\left(\frac{x}{3}\right)$ for $-180° \leqslant x° \leqslant 180°$.



[3]

MARKING SCHEME

(a)	4	**B1**	
(b)	1080° or 6π	**B1**	
(c)		**3**	**B1** for shape, it must be symmetrical about the y-axis. **B1** for y-intercept of 5 **B1** for $(\pm 180^{\circ}, 3)$