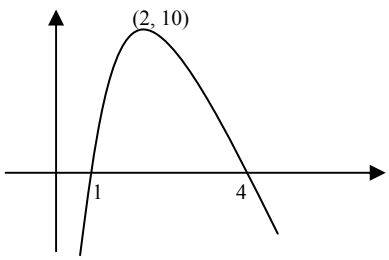
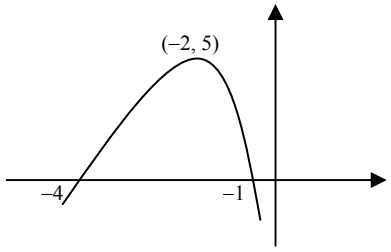
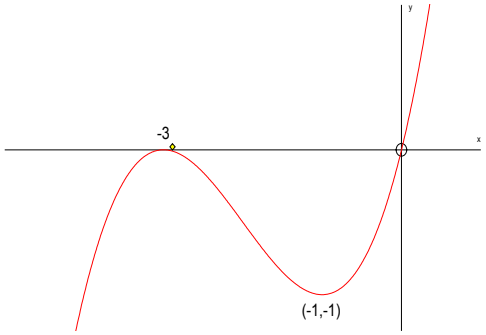
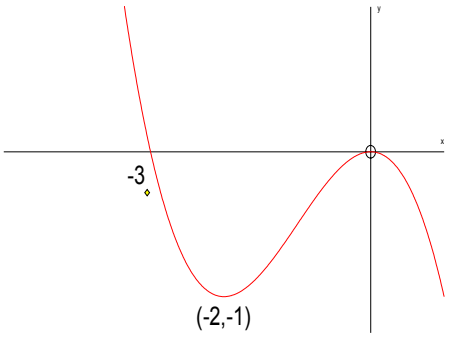
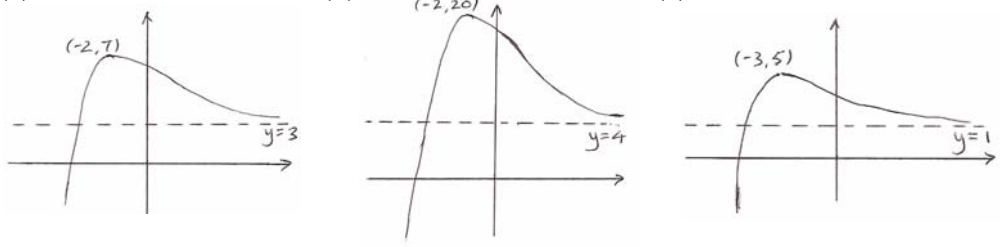
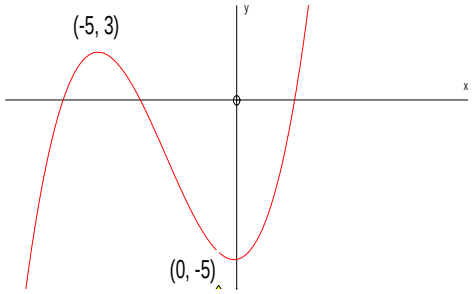
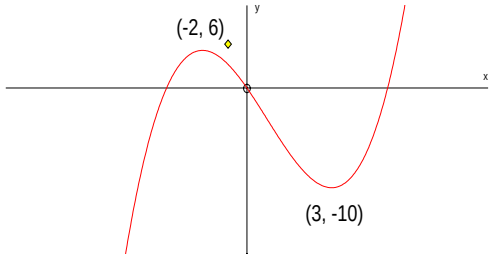
Question number	Scheme		Marks
6.	(a) 	Shape: Max in 1st quadrant and 2 intersections on positive x-axis 1 and 4 labelled (in correct place) or clearly stated as coordinates (2, 10) labelled or clearly stated	B1 B1 B1 (3)
	(b) 	Shape: Max in 2nd quadrant and 2 intersections on negative x-axis –1 and –4 labelled (in correct place) or clearly stated as coordinates (–2, 5) labelled or clearly stated	B1 B1 B1 (3)
	(c) (a =) 2	May be implicit, i.e. $f(x+2)$	B1 (1)
	Beware: The answer to part (c) may be seen on the first page.		**7**
	(a) and (b): 1st B: 'Shape' is generous, providing the conditions are satisfied. 2nd and 3rd B marks are dependent upon a sketch having been drawn. 2nd B marks: Allow (0, 1), etc. (coordinates the wrong way round) <u>if</u> the sketch is correct. Points must be labelled correctly and be in appropriate place (e.g. (–2, 5) in the first quadrant is B0). (b) <u>Special case</u>: If the graph is reflected in the x-axis (instead of the y-axis), B1 B0 B0 can be scored. This requires shape and coordinates to be <u>fully correct</u>, i.e. Shape: Minimum in 4th quadrant and 2 intersections on positive x-axis, 1 and 4 labelled (in correct place) or clearly stated as coordinates, (2, –5) labelled or clearly stated.		

Question Number	Scheme	Marks
5 (a)	 Shape , touching the x-axis at its maximum. Through $(0,0)$ & -3 marked on x-axis, or $(-3,0)$ seen. Allow $(0,-3)$ if marked on the x-axis. Marked in the correct place, but 3, is A0. Min at $(-1,-1)$	M1 A1 A1 (3)
(b)	 Correct shape (top left - bottom right) Through -3 and max at (0, 0). Marked in the correct place, but 3, is B0. Min at $(-2,-1)$	B1 B1 B1 (3) **[6]**
(a)	M1 as described above. Be generous, even when the curve seems to be composed of straight line segments, but there must be a discernible 'curve' at the max. and min. 1st A1 for curve passing through -3 and the origin. Max at $(-3,0)$ 2nd A1 for minimum at $(-1,-1)$. Can simply be indicated on sketch.	
(b)	1st B1 for the correct shape. A negative cubic passing from top left to bottom right. Shape: Be generous, even when the curve seems to be composed of straight line segments, but there must be a discernible 'curve' at the max. and min. 2nd B1 for curve passing through $(-3,0)$ having a max at (0, 0) and no other max. 3rd B1 for minimum at $(-2,-1)$ and no other minimum. If in correct quadrant but labelled, e.g. $(-2,1)$, this is B0. In each part the (0, 0) does <u>not</u> need to be written to score the second mark… having the curve pass through the origin is sufficient. The last mark (for the minimum) in each part is dependent on a sketch being attempted, and the sketch must show the minimum in approximately the correct place (not, for example, $(-2,-1)$ marked in the wrong quadrant). The mark for the minimum is <u>not</u> given for the coordinates just marked on the axes <u>unless</u> these are clearly linked to the minimum by vertical and horizontal lines.	

Question number	Scheme	Marks
Q8	(a) (b) (c)  	
	(a) (–2, 7), $y = 3$ (Marks are dependent upon a sketch being attempted) See conditions below.	B1, B1 (2)
	(b) (–2, 20), $y = 4$ (Marks are dependent upon a sketch being attempted) See conditions below.	B1, B1 (2)
	(c) Sketch: Horizontal translation (either way)… (There must be evidence that $y = 5$ at the max and that the asymptote is still $y = 1$) (–3, 5), $y = 1$	B1 B1, B1 (3) **[7]**
	Parts (a) and (b): (i) If only one of the B marks is scored, there is no penalty for a wrong sketch. (ii) If both the maximum and the equation of the asymptote are correct, the sketch must be "correct" to score B1 B1. If the sketch is "wrong", award B1 B0. The (generous) conditions for a "correct" sketch are that the maximum must be in the 2nd quadrant and that the curve must not cross the positive x-axis... ignore other "errors" such as "curve appearing to cross its asymptote" and "curve appearing to have a minimum in the 1st quadrant". Special case: (b) Stretch $\frac{1}{4}$ instead of 4: Correct shape, with $\left(-2, \frac{5}{4}\right)$, $y = \frac{1}{4}$: B1 B0. Coordinates of maximum: If the coordinates are the wrong way round (e.g. (7, –2) in part (a)), or the coordinates are just shown as values on the x and y axes, penalise only once in the whole question, at first occurrence. Asymptote marks: If the equation of the asymptote is not given, e.g. in part (a), 3 is marked on the y-axis but $y = 3$ is not seen, penalise only once in the whole question, at first occurrence. Ignore extra asymptotes stated (such as $x = 0$).	

Question Number	Scheme	Marks
6.		
(a)		
	Horizontal translation of ± 3	M1
	$(-5, 3)$ marked on sketch **or in text**	B1
	$(0, -5)$ and min intentionally on y-axis Condone $(-5, 0)$ if correctly placed on negative y-axis	A1 (3)
(b)		
	Correct shape and intentionally through (0,0) between the max and min	B1
	$(-2, 6)$ marked on graph **or in text**	B1
	$(3, -10)$ marked on graph **or in text**	B1 (3)
(c)	$(a =)$ 5	B1 (1)

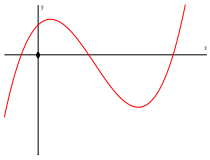
Notes

Turning points (not on axes) should have both co-ordinates given in form(x,y) .
Do not accept points marked on axes e.g. -5on x-axis and 3 on y-axis is not sufficient.
For repeated offenders apply this penalty **once only** at first offence and condone elsewhere.

In (a) and (b) no graphs means no marks.

In (a) and (b) the ends of the graphs do not need to cross the axes provided max and min are clear

(a)



M1 for a horizontal translation of ± 3 so accept i.e max in 1st quad and coordinates of $(1, 3)$ or $(6, -5)$ seen.
[Horizontal translation to the left should have a min on the y-axis]
If curve passes through (0,0) then M0 (and A0) but they could score the B1 mark.

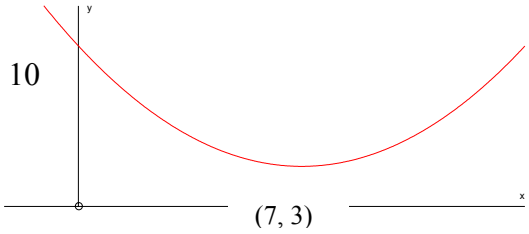
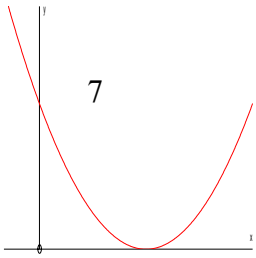
A1 for minimum clearly on negative y-axis and at least -5 marked on y-axis.
Allow this mark if the minimum is very close and the point $(0, -5)$ clearly indicated

(b)

1st B1 Ignore coordinates for this mark
Coordinates or points on sketch override coordinates given in the text.
Condone (y, x) confusion for points on axes only. So $(-5,0)$ for $(0, -5)$ is OK if the point is marked correctly but (3,10) is B0 even if in 4th quadrant.

(c)

This may be at the bottom of a page or in the question...make sure you scroll up and down!

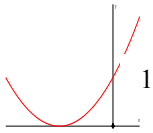
Question number	Scheme	Marks
3	(a)  (b)  	B1B1B1 (3) B1B1 (2) **5**

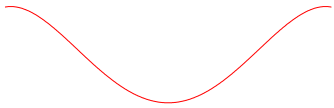
(a) Allow "stopping at" (0, 10) or (0, 7) instead of "cutting"

1st B1 for moving the given curve up. Must be U shaped curve, minimum in first quadrant, not touching *x*-axis but cutting positive *y*-axis. Ignore any values on axes.

2nd B1 for curve cutting *y*-axis at (0, 10) . Point 10(or even (10, 0) marked on positive *y*-axis is OK)

3rd B1 for minimum indicated at (7, 3). Must have both coordinates and in the right order.





If the curve flattens out to a turning point like this penalise <u>once</u> at first offence ie 1st B1 in (a) or in (b) but not in both.

this would score B0B1B0

The U shape mark can be awarded if the sides are fairly straight as long as the vertex is rounded.

(b) 1st B1 for U shaped curve, touching positive *x*-axis and crossing *y*-axis at (0, 7)[condone (7, 0) if marked on positive *y* axis] or 7 marked on *y*-axis

2nd B1 for minimum at (3.5, 0) or 3.5 or $\frac{7}{2}$ marked on *x*-axis. Do <u>not</u> condone (0, 3.5) here.

Redrawing f(*x*) will score B1B0 in part (b).

Points on sketch override points given in text/table.
If coordinates are given elsewhere (text or table) marks can be awarded if they are compatible with the sketch.