Mark scheme

Equations, inequalities and graphs

Additional Mathematics 0606 · Questions from Paper 1 and Paper 2

Total marks

44

MARKS FOR EACH QUESTION

1	2	3	4	5	6	7	8	9	10	Total
3	3	4	4	4	5	5	5	5	6	**44**

Question 1 [3]

1	$x = 1$	**B1**	
	$-3x - 2 = x + 4$ oe	**M1**	
	$x = -1.5$ oe	**A1**	

Question 2 [3]

2	$y = \pm 3(x+2)(x+1)(x-4)$	**3**	**B1** for 3 **B1** for $(x+2)(x+1)(x-4)$ **B1** for $\pm$

Question 3 [4]

3	$x^{\frac{2}{3}} + x^{\frac{1}{3}} - 6 \ (=0)$ oe soi	**B1**	For multiplying through by $x^{\frac{1}{3}}$ Allow if substitution is used
	$\left(x^{\frac{1}{3}} + 3\right)\left(x^{\frac{1}{3}} - 2\right) \ (=0)$ oe	**M1**	Allow if substitution is used
	$x = -27$	**A1**	**A0** if rejects $x = -27$
	$x = 8$	**A1**	

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Question 4 [4]

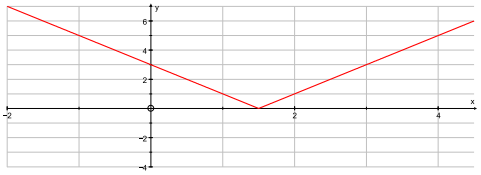
4	$7x + 5 = 3x - 13$ $x = -4.5$ o.e. $7x + 5 = 3x + 13$ $x = 0.8$ o.e. OR Square and Equate $10x^2 + 37x - 36(= 0)$ o.e. $(5x - 4)(2x + 9)[= 0]$ $x = 0.8$ and $x = -4.5$ OR Plot $y = \lvert 7x + 5 \rvert$ Plot $y = \lvert 3x - 13 \rvert$ $x = 0.8$ $x = -4.5$	M1 A1 M1 A1 [4] M1 A1 M1 A1 M1 M1 A1 A1	Equate and attempt to solve Equate Mark final answers Both expressions must have 3 terms Three terms Factorise or formula of three term quadratic. Shape and intercepts must be correct Shape and intercepts must be correct

Question 5 [4]

5	$5x+2*3$ and $5x+2*-3$ oe	**M1**	where * could be = or any inequality sign
	Critical values: $\frac{1}{5}$, -1 soi	**A2**	**A1** for one correct value
	$x \leqslant -1 \quad x \geqslant \frac{1}{5}$ oe mark final answer	**A1**	
	Alternative method		
	$(5x+2)^2 * 3^2$	**(M1)**	where * could be = or any inequality sign
	Critical values: $\frac{1}{5}$, -1 soi	**(A2)**	**A1** for $25x^2+20x-5[*0]$
	$x \leqslant -1 \quad x \geqslant \frac{1}{5}$ oe mark final answer	**(A1)**	

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Question 6 [5]

6(i)		**B2**	**B1** shape **B1** Correct intersection with axes.
6(ii)	$7 = 2x - 3 \rightarrow x = 5$	**B1**	
	Uses $7 = 3 - 2x$ oe	**M1**	
	$x = -2$	**A1**	

Question 7 [5]

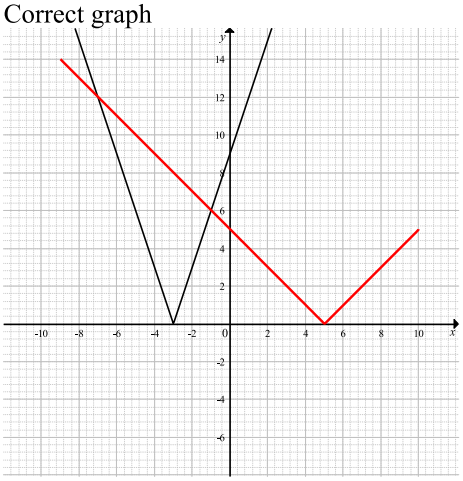
7	$x^2 - 5x = 6 \Rightarrow x^2 - 5x - 6 = 0$ $(x - 6)(x + 1) = 0$	**M1**	or $x = \frac{5 \pm \sqrt{25 - 4 \times (-6)}}{2}$
	$x = 6$ or -1	**A1**	
	$x^2 - 5x = -6 \Rightarrow x^2 - 5x + 6 = 0$	**M1**	
	$(x - 3)(x - 2) = 0$	**M1**	or $x = \frac{5 \pm \sqrt{25 - 4 \times 6}}{2}$
	$x = 3$ or 2	**A1**	
	Alternative method		
	$\left(x^2 - 5x\right)^2 = 36$	**(M1)**	
	$x^4 - 10x^3 + 25x^2 - 36 = 0$	**(A1)**	
	$(x - 3)(x - 2)(x - 6)(x + 1) = 0$	**(M1)**	Attempt to factorise into 4 brackets
	$x = -1$ or 2 or 3 or 6	**(A1A1)**	**A1** for any two

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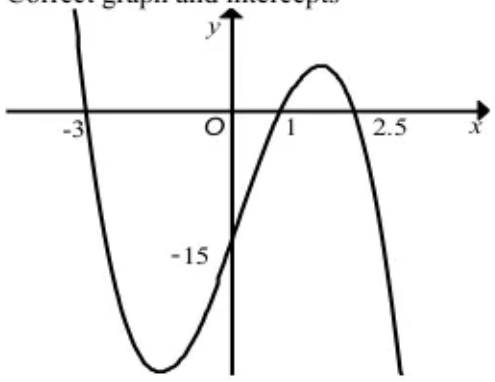
Question 8 [5]

8(a)	$a = 2$, $b = 1$, $c = -1$	**B2**	**B1** for any two correct
8(b)	Finds three correct critical values: -1.5 to -1.4 inclusive -0.4 0.8 to 0.9 inclusive	**B1**	
	A correct pair of inequalities	**B2**	**B1** for either inequality correct

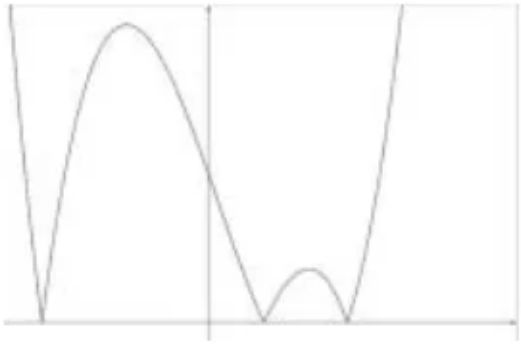
Question 9 [5]

9(a)	$4x - 5 = 7$ and $4x - 5 = -7$ oe, soi	**M1**	
	$x = 3$, $x = -\frac{1}{2}$	**A1**	
9(b)	Correct graph  AND $-7 \leqslant x \leqslant -1$	**3**	**B1** for correct graph and **B2 dep** for $-7 \leqslant x \leqslant -1$; dependent on a correct graph for $-7 \leqslant x \leqslant -1$ or **B1 STRICT FT** for *their* critical values from the two intersections of *their* straight-line section of graph providing it has negative gradient

Question 10 [6]

10(a)	Correct graph and intercepts  	**B3**	**B1** for correct shape; the ends must extend above and below the x-axis **B1** for correct roots indicated; must have attempted a cubic shape **B1** for correct y-intercept indicated; must have attempted a cubic shape

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10(b)(i)	$-3 \leqslant x \leqslant 1$, $x \geqslant 2.5$ mark final answer	**B2**	**FT** *their* **(a)** providing it is an equivalent cubic shape and has 3 stated or indicated roots for **B2, B1** or **SC1** **B1** for one correct inequality out of two If 0 scored then **SC1** for $-3 < x < 1$, $x > 2.5$ or $-3 < x \leqslant 1$, $x > 2.5$ or $-3 \leqslant x < 1$, $x > 2.5$
10(b)(ii)	Graph of correct shape, with cusps, positive y-intercept and x-intercepts which match **(a)** 	**B1**	**FT** *their* **(a)** providing it is an equivalent cubic shape

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