Edexcel GCE

Mathematics

Core Mathematics C1 6663

Summer 2005

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Confidential Mark Scheme

Edexcel GCE
Mathematics

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General Instructions

1. The total number of marks for the paper is 75.

2. Method (M) marks are awarded for 'knowing a method and attempting to apply it', unless otherwise indicated.

3. Accuracy (A) marks can only be awarded if the relevant method (M) marks have been earned.

4. (B) marks are independent of method marks.

5. Method marks should not be subdivided.

6. For misreading which does not alter the character of a question or materially simplify it, deduct two from any A or B marks gained, in that part of the question affected. Indicate this action by 'MR' in the body of the script (but see also note 10).

7. If a candidate makes more than one attempt at any question:

   (a) If all but one attempt is crossed out, mark the attempt which is NOT crossed out.

   (b) If either all attempts are crossed out or none are crossed out, mark all the attempts and score the highest single attempt.

8. Marks for each question, or part of a question, must appear in the right-hand margin and, in addition, total marks for each question, even where zero, must be ringed and appear in the right-hand margin and on the grid on the front of the answer book. It is important that a check is made to ensure that the totals in the right-hand margin of the ringed marks and of the unringed marks are equal. The total mark for the paper must be put on the top right-hand corner of the front cover of the answer book.

9. For methods of solution not in the mark scheme, allocate the available M and A marks in as closely equivalent a way as possible, and indicate this by the letters 'OS' (outside scheme) put alongside in the body of the script.

10. All A marks are 'correct answer only' (c.a.o.) unless shown, for example, as A1 f.t. to indicate that previous wrong working is to be followed through. In the body of the script the symbol $\surd$ should be used for correct f.t. and $\not\surd$ for incorrect f.t. After a misread, however, the subsequent A marks affected are treated as A f.t., but manifestly absurd answers should never be awarded A marks.

11. Ignore wrong working or incorrect statements following a correct answer.

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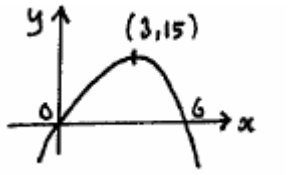
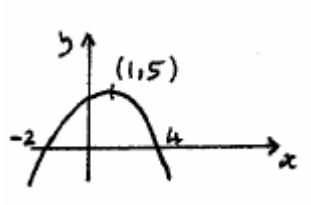
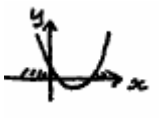
June 2005
6663 Core Mathematics C1
Mark Scheme

Question Number	Scheme	Marks
1. (a)	$\underline{2}$	B1 (1)
(b)	$8^{-\frac{2}{3}} = \frac{1}{\sqrt[3]{64}}$ or $\frac{1}{(a)^2}$ $= \frac{1}{4}$ or 0.25	M1 A1 (2) **(3)**
(b)	$8^{\frac{2}{3}} = 4$ is M0A0	
2. (a)	$\frac{dy}{dx} = 6 + 8x^{-3}$ $\quad x^n \rightarrow x^{n-1}$ both	M1 A1 (2)
(b)	$\int (6x - 4x^{-2})dx = \frac{6x^2}{2} + 4x^{-1} + c$	M1 A1 A1 (3) **(5)**
(b)	In (a) and (b) M1 is for a correct power of x in at least one term. This could be 6 in (a) or $+c$ in (b) 1st A1 for one correct term in x: $\frac{6x^2}{2}$ or $+4x^{-1}$ (or better simplified versions) 2nd A1 for all 3 terms as printed or better	

Question Number	Scheme	Marks
3. (a)	$x^2 - 8x - 29 \equiv (x-4)^2 - 45$ $(x \pm 4)^2$ $(x-4)^2 - 16(-29)$ $(x-4)^2 - 45$	M1 A1 A1 (3)
ALT	Compare coefficients $-8 = 2a$ equation for a $a = -4$ AND $a^2 + b = -29$ $b = -45$	M1 A1 A1 (3)
(b)	$(x-4)^2 = 45$ $\Rightarrow x - 4 = \pm\sqrt{45}$ $x = 4 \pm 3\sqrt{5}$ $c = 4$ $d = 3$	M1 A1 A1 (3) **(6)**
(a)	M1 for $(x \pm 4)^2$ or an equation for a 1stA1 for $(x-4)^2 - 16(-29)$ can ignore -29 or for stating $a = -4$ and an equation for b 2nd A1 for $b = -45$ Note M1A0 A1 is possible for $(x+4)^2 - 45$	
(b)	M1 for a full method leading to $x - 4 = ...$ or $x = ...$ A1 for c and A1 for d Note Use of formula that ends with $\frac{8 \pm 6\sqrt{5}}{2}$ scores M1 A1 A0	

Question Number	Scheme	Marks
4. (a)	 Shape Points	B1 B1 (2)
(b)	 Horizontal translation -2 and 4 max	M1 A1 A1 (3) **(5)**
(a)	1st B1 for $\cap$ shape through (0, 0) and $(k,0)$ where $k>0$ 2nd B1 for max at (3, 15) and 6 labelled or (6, 0) seen	
(b)	M1 for $\cap$ shape <u>NOT</u> through (0, 0) 1st A1 for -2 and 4 labelled or (-2, 0) and (4, 0) seen 2nd A1 for max at (1, 5)	
5.	$x = 1+2y$ and sub $\rightarrow (1+2y)^2 + y^2 = 29$ $\Rightarrow 5y^2 + 4y - 28 (= 0)$ i.e. $(5y+14)(y-2) = 0$ $y = 2$ or $-\frac{14}{5}$ (both) $y = 2 \Rightarrow x = 1+4 = 5$; $y = -\frac{14}{5} \Rightarrow x = -\frac{23}{5}$	M1 A1 M1 A1 M1A1 f.t. **(6)**
	1st M1 Attempt to sub leading to equation in 1 variable Condone sign error such as $1-2y$ 1st A1 Correct 3TQ (condone = 0 missing) 2nd M1 Attempt to solve 3TQ leading to $y = ...$ 3rd M1 Attempt to find at least one x value 3rd A1 f.t. f.t. only in $x = 1+2y$ (3sf if not exact) Both values	

Question Number	Scheme	Marks
6. (a)	$6x+3 > 5-2x \quad \Rightarrow 8x > 2$ $x > \frac{1}{4}$ or 0.25 or $\frac{2}{8}$	M1 A1 (2)
(b)	$(2x-1)(x-3) \quad (> 0)$	M1
	Critical values $x = \frac{1}{2}$, 3 (both)	A1
	 Choosing "outside" region $x > 3$ or $x < \frac{1}{2}$	M1 A1 f.t. (4)
(c)	$x > 3$ or $\frac{1}{4} < x < \frac{1}{2}$	B1f.t. B1f.t. (2) **(8)**

(a) M1 Multiply out and collect terms (allow one slip)

(b) 1st M1 Attempting to factorise 3TQ $\rightarrow x = ...$

2nd M1 Choosing the outside region

2nd A1 f.t. f.t. their critical values

(c) f.t. their answers to (a) and (b)
1st B1 a correct f.t. leading to an <u>infinite</u> region
2nd B1 a correct f.t. leading to a <u>finite</u> region

Penalise $\leq$ or $\geq$ once only at first offence.

Question Number	Scheme	Marks
7. (a)	$(3-\sqrt{x})^2 = 9-6\sqrt{x}+x$	M1
	$\div by\sqrt{x} \quad \rightarrow 9x^{-\frac{1}{2}} - 6 + x^{\frac{1}{2}}$	A1 c.s.o.
		(2)
(b)	$\int (9x^{-\frac{1}{2}} - 6 + x^{\frac{1}{2}})dx = \frac{9x^{\frac{1}{2}}}{\frac{1}{2}} - 6x + \frac{x^{\frac{3}{2}}}{\frac{3}{2}} (+c)$	M1 A2/1/0
	use $y = \frac{2}{3}$ and $x = 1$: $\quad \frac{2}{3} = 18 \quad -6 + \frac{2}{3} + c$	M1
	So $\quad y = 18x^{\frac{1}{2}} - 6x + \frac{2}{3}x^{\frac{3}{2}}$, -12	A1, A1
		(6)
		(8)
(a)	M1 Attempt to multiply out $(3-\sqrt{x})^2$	
(b)	1st M1 Some correct integration: $x^n \rightarrow x^{n+1}$	
	A1 At least 2 correct unsimplified terms Ignore + c	
	A2 All 3 terms correct (unsimplified)	
	2nd M1 Use of $y = \frac{2}{3}$ and $x = 1$ to find c. N0 + c is M0.	
	A1 for 3 simplified x terms with $a \quad y =$	
	A1 for -12. Award this mark if " $c = -12$ " stated	

Question Number	Scheme	Marks
8. (a)	$y-(-4)=\frac{1}{3}(x-9)$ $3y-x+21=0$ (o.e.)	M1 A1 A1 c.a.o (3)
(b)	Equation of l_2 is: $y=-2x$ (o.e.) Solving l_1 and l_2 : $-6x-x+21=0$ p is point where $x_p=3$, $y_p=-6$ x_p y_p	B1 M1 A1 A1f.t. $(-2x)$ (4)
(c)	(l_1 is $y=\frac{1}{3}x-7$) C is (0, -7) or OC = 7 Area of $\Delta OCP=\frac{1}{2}OC\times x_p$, $=\frac{1}{2}\times 7\times 3=10.5$	B1 M1 A1 f.t. (3) **(10)**
(a)	M1 for full method to find equation of l_1 1stA1 any unsimplified form	
(b)	M1 Attempt to solve two linear equations leading to linear equation in one variable 2nd A1 f.t. only f.t. their x_p in $y=-2x$	
(c)	M1 for correct attempt in letters or symbols for ΔOCP A1 f.t. f.t. their x_p and their OC but given an <u>exact</u> answer	

Question Number	Scheme	Marks
9 (a)	$S = a + (a+d) + \ldots \quad \ldots + [a + (n-1)d]$ $S = [a + (n-1)d] + \ldots \quad \ldots + a$ $2S = [2a + (n-1)d] + \ldots \quad \ldots + [2a + (n-1)d]$ } either $2S = n[2a + (n-1)d]$ $S = \frac{n}{2}[2a + (n-1)d]$ $(a = 149,\ d = -2)$	B1 M1 M1 A1 c.s.o (4)
(b)	$u_{21} = 149 + 20(-2) = £109$	M1 A1 (2)
(c)	$S_n = \frac{n}{2}[2 \times 149 + (n-1)(-2)]$ $(= n(150 - n))$ $S_n = 5000 \Rightarrow n^2 - 150n + 5000 = 0$	M1 A1 A1 c.s.o (3)
(d)	$(n-100)(n-50) = 0$ $n = 50$ or 100	M1 A1 A1 (3)
(e)	$u_{100} < 0 \quad \therefore n = 100$ not sensible	B1 f.t. (1) **(13)**
(a) (b) (c) (d) (e)	1st M1 for reversing series 2nd M1 for adding. Either line is sufficient M1 for identifying a, d ad using in $a + (n-1)d$ formula M1 for using their a, d in S_n A1 any correct expression M1 Attempt to factorise leading to $n = \ldots$ B1 f.t. Must mention 100 and state $u_{100} < 0$ (or loan paid or equivalent) f.t. then $n \geq 76$.	

Question Number	Scheme	Marks
10 (a)	$x = 3, \quad y = 9 - 36 + 24 + 3 = 0$	B1 (1)
(b)	$\frac{dy}{dx} = \frac{3}{3}x^2 - 2 \times 4 \times x^2 + 8$ $(x^2 - 8x + 8)$	M1 A1
	$\left.\frac{dy}{dx}\right\|_{x=3} = 9 - 24 + 8 \Rightarrow m = -7$	M1
	Equation of tangent: $y - 0 = -7(x - 3)$ $y = -7x + 21$	M1 A1 c.a.o (5)
(c)	$\frac{dy}{dx} = m$ gives $x^2 - 8x + 8 = -7$	M1
	$(x^2 - 8x + 15 = 0)$ $(x - 5)(x - 3) = 0$ $x = (3)$ or 5	M1 A1 5
	$\therefore y = \frac{1}{3}5^3 - 4 \times 5^2 + 8 \times 5 + 3$	M1
	$y = -15\frac{1}{3}$ or $-\frac{46}{3}$	A1 (5)
		(11)
(b)	1st M1 some correct differentiation ($x^n \rightarrow x^{n-1}$ for one term)	
	1st A1 correct unsimplified (all 3 terms)	
	2nd M1 substituting $x = 3$ in their $\frac{dy}{dx}$	
	3rd M1 using their m to find tangent at p	
(c)	1st M1 forming a correct equation " their y = their m "	