GCE

Edexcel GCE

Mathematics

Core Mathematics C1 (6663)

June 2006

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Mark Scheme

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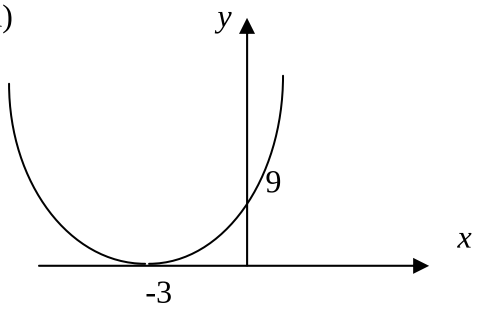
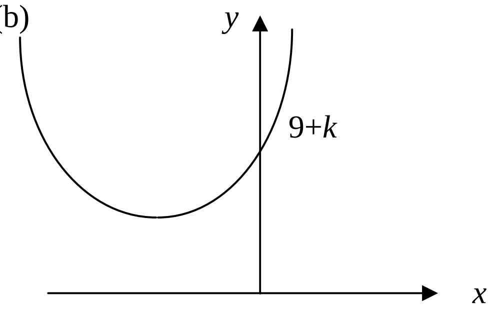
Question number	Scheme	Marks
1.	$\frac{6x^3}{3} + 2x + \frac{x^{\frac{1}{2}}}{\frac{1}{2}} \quad (+c)$	M1
	$= 2x^3 + 2x + 2x^{\frac{1}{2}}$	A2/1/0
	$+c$	B1
		4
	M1 for some attempt to integrate $x^n \to x^{n+1}$ 1st A1 for either $2x^3$ or $2x^{\frac{1}{2}}$ 2nd A1 for all terms in x correct as printed B1 for + c.	

Question number	Scheme	Marks
2.	<u>Critical Values</u> $(x-9)(x+2) > 0$ or $= 0$	M1
	$x = -2$ or 9 both	A1
	<u>Solving Inequality</u> $x > 9$ or $x < -2$ Choosing "outside"	M1
		A1 **4**
	1st M1 For attempting to find critical values. Full Method leading to $x = \ldots$ 2nd M1 For choosing outside region. Can f.t. their critical values. $-2 > x > 9$ is M1A0	

Question number	Scheme	Marks
3.	(a)  U shape touching x-axis (- 3, 0) (0, 9)	B1 B1 B1 (3)
	(b)  Translated parallel to y-axis up or down $(0, 9+k)$	M1 B1f.t. (2) **5**
	(b) M1 Follow their curve in (a) up or down only B1f.t. Follow through their 9	

Question number	Scheme	Marks
4. (a)	$a_2 = 4$ $a_3 = 3 \times a_2 - 5 = 7$	B1 B1f.t. (2)
(b)	$a_4 = 3a_3 - 5 (= 16)$ and $a_5 = 3a_4 - 5 (= 43)$ 3 + 4 + 7 + 16 + 43 = 73	M1 M1 A1c.a.o. (3) **5**
(a)	2^{nd} B1f.t. Follow through their a_2 but it must be a value	
(b)	1^{st} M1 For two further uses of $a_{n+1} = 3a_n - 5$ 2^{nd} M1 For attempting to add 5 relevant terms or an expression. Follow through their values for $a_2 - a_5$	

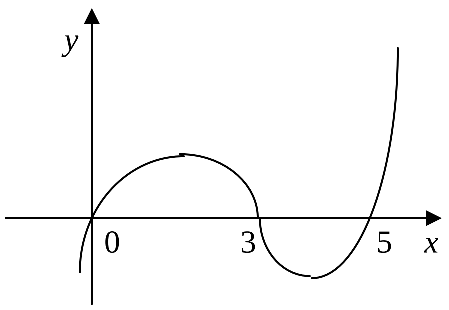
Question number	Scheme	Marks
5. (a)	$(y = x^4 + 6x^{\frac{1}{2}} \Rightarrow y' =)\ \ 4x^3 + 3x^{-\frac{1}{2}}$	M1A1A1 (3)
(b)	$(x+4)^2 = x^2 + 8x + 16$	M1
	$\dfrac{(x+4)^2}{x} = x + 8 + 16x^{-1}$	A1
	$(y = \dfrac{(x+4)^2}{x} \Rightarrow y' =)\ \ 1 - 16x^{-2}$	M1A1 (4)
		7

(a)	M1	For some attempt to differentiate $x^n \to x^{n-1}$
	1st A1	For one correct term as printed.
	2nd A1	For both terms correct as printed.
		$4x^3 + 3x^{-\frac{1}{2}} + c$ scores M1A1A0
(b)	1st M1	For attempt to expand $(x+4)^2$, must have 3 terms and at least 2 correct
	1st A1	Correct expression.
	2nd M1	For some correct differentiation. Can follow through their simplification.
ALT	<u>Product or Quotient rule</u>	
	M2	For correct use of product or quotient rule
	1st A1	For $\dfrac{2(x+4)}{x}$
	2nd A1	for $-\dfrac{(x+4)^2}{x^2}$

Question number	Scheme	Marks
6. (a)	$16+4\sqrt{3}-4\sqrt{3}-\left(\sqrt{3}\right)^2$ or $16-3$	M1
	$= 13$	A1c.a.o (2)
(b)	$\dfrac{26}{4+\sqrt{3}} \times \dfrac{4-\sqrt{3}}{4-\sqrt{3}}$	M1
	$= \dfrac{26(4-\sqrt{3})}{13} = \underline{8-2\sqrt{3}}$	A1 (2)
		4
(a)	M1 For 4 terms, condone 1 sign error	
(b)	M1 For a correct attempt to rationalise the denominator	

Question number	Scheme	Marks
7.	$(u_{11} =)\ a + 10d = 9$	M1A1
	$(S_{11} =)\ \frac{11}{2}(2a + 10d) = 77$ or $\frac{(a+9)}{2} \times 11 = 77$	M1A1
	e.g. $a + 10d = 9$, $a + 5d = 7$ or $a + 9 = 14$	M1
	$a = 5$ and $d = 0.4$	A1 A1
		7
	1st M1 — Use of u_n to form a linear equation in *a* and *d*.	
	2nd M1 — Use of S_{11} to form an equation for *a* and *d* (LHS) or in *a* (RHS)	
	2nd A1 — Either correct equation	
	3rd M1 — Solving (LHS simultaneously) or (RHS a linear equation in *a*) Must lead to $a = \ldots$ or $d = \ldots.$	
	3rd A1 — for $a = 5$	
	4th A1 — for $d = 0.4$ (o.e.)	

Question number	Scheme	Marks
8. (a)	$b^2 - 4ac = 4p^2 - 4(3p+4) = 4p^2 - 12p - 16\ (=0)$	M1, A1
	or $(x+p)^2 - p^2 + (3p+4) = 0 \;\Rightarrow\; p^2 - 3p - 4(=0)$	
	$(p - 4)(p + 1) = 0$	M1
	$p = (-1 \text{ or})\ 4$	A1 (4)
(b)	$x = \dfrac{-b}{2a}$ or $(x+p)(x+p) = 0 \;\Rightarrow\; x = \ldots$	M1
	$x\ (= -p) = \underline{-4}$	A1f.t. (2)
		6
(a)	1st M1 For use of $b^2 - 4ac$ or a full attempt to complete the square leading to a 3TQ in p.	
	1st A1 For a correct 3TQ in p. Condone missing "=0" but all 3 terms must be on one side.	
	2nd M1 For attempt to solve their 3TQ leading to $p = \ldots$	
	2nd A1 For $p = 4$ (ignore $p = -1$).	
(b)	M1 For a full method leading to $x = \ldots$	
	A1f.t. For $x = -4$ (- their p)	

Question number	Scheme		Marks	
9. (a)	$f(x) = x[(x-6)(x-2)+3]$ or $x^3 - 6x^2 - 2x^2 + 12x + 3x = x(....)$		M1	
	$f(x) = x(x^2 - 8x + 15)$	b= - 8 or c = 15	A1	
		both and a = 1	A1	(3)
(b)	$(x^2 - 8x + 15) = (x-5)(x-3)$		M1	
	$f(x) = x(x-5)(x-3)$		A1	(2)
(c)		Shape	B1	
		their 3 <u>or</u> their 5	B1f.t.	
		<u>both</u> their 3 <u>and</u> their 5 and (0,0) by implication	B1f.t.	(3)
				8

(a)	M1 for a correct method to get the factor of x 1st A1 for b = -8 or c = 15 2nd A1 for a =1, b = -8 and c = 15.
(b)	M1 for attempt to factorise their quadratic from part (a). A1 for all 3 terms correct.
(c)	1st B1 for correct shape (i.e. from bottom left to top right and two turning points.) 2nd B1f.t. for crossing at their 3 or their 5 indicated on graph or in text. 3rd B1f.t. if graph passes through (0, 0) [needn't be marked] and both their 3 and their 5.

Question number	Scheme	Marks
10.(a)	f(x) = $\frac{2x^2}{2}+\frac{3x^{-1}}{-1}(+c)$	M1A1
	$(3, 7\tfrac{1}{2})$ gives $\frac{15}{2}=9-\frac{3}{3}+c$	M1A1f.t.
	$c = -\frac{1}{2}$	A1 (5)
(b)	f(-2) = 4 $+\frac{3}{2}-\frac{1}{2}$ (*)	B1c.s.o. (1)
(c)	m = - 4 + $\frac{3}{4}$, = -3.25	M1,A1
	Equation of tangent is: $y - 5 = -3.25(x + 2)$	M1
	$\underline{4y + 13x + 6 = 0}$ o.e.	A1 (4)
		10
(a)	1st M1 for some attempt to integrate $x^n \to x^{n+1}$	
	1st A1 for both x terms as printed or better. Ignore (+c) here.	
	2nd M1 for use of $(3, 7\tfrac{1}{2})$ to form an equation for c. No +c is M0.	
	2nd A1 for a correct equation for c. Follow through their integration.	
(c)	1st M1 for attempting $m = \text{f}'(-2)$	
	1st A1 for $-\frac{13}{4}$ or -3.25	
	2nd M1 for attempting equation of tangent at (-2, 5), f.t. their m.	
	2nd A1 o.e. must have a, b and c integers.	

Question number	Scheme	Marks
11.(a)	$m = \dfrac{8-2}{11+1} \quad (= \dfrac{1}{2})$	M1 A1
	$y - 2 = \dfrac{1}{2}(x - -1)$	M1
	$y = \dfrac{1}{2}x + \dfrac{5}{2}$	A1c.a.o. (4)
(b)	Gradient of $l_2 = -2$	M1
	Equation of l_2: $y - 0 = -2(x - 10)$ [$y = -2x + 20$]	M1
	$\dfrac{1}{2}x + \dfrac{5}{2} = -2x + 20$	M1
	$\underline{x = 7 \quad \text{and} \quad y = 6}$	A1, A1 (5)
(c)	$RS^2 = (10-7)^2 + (0-6)^2 = 3^2 + 6^2$	M1
	$RS = \sqrt{45} = 3\sqrt{5}$ (*)	A1c.s.o. (2)
(d)	$PQ = \sqrt{12^2 + 6^2}, = 6\sqrt{5}$	M1,A1
	Area $= \dfrac{1}{2} PQ \times RS = \dfrac{1}{2} 6\sqrt{5} \times 3\sqrt{5}$	M1
	$\underline{= 45}$	A1 (4)
		15
(a)	1st M1 for attempting $\dfrac{y_1 - y_2}{x_1 - x_2}$, must be y over x but condone one sign slip. 1st A1 for a fully correct expression, needn't be simplified. 2nd M1 for attempting to find equation of l_1.	
(b)	1st M1 for using the perpendicular gradient rule 2nd M1 for attempting to find equation of l_2. Follow their gradient provided different. 3rd M1 for forming a suitable equation to find S.	
(c)	M1 for expression for RS or RS^2.	
(d)	1st M1 for expression for PQ or PQ^2 2nd M1 for a full, correct attempt at area of triangle	

GENERAL PRINCIPLES FOR C1 MARKING

Method mark for solving 3 term quadratic:

1. Factorisation

$(x^2 + bx + c) = (x + p)(x + q)$, where $|pq| = |c|$, leading to $x = \ldots$

$(ax^2 + bx + c) = (mx + p)(nx + q)$, where $|pq| = |c|$ and $|mn| = |a|$, leading to $x = \ldots$

2. Formula

Attempt to use correct formula (with values for a, b and c).

3. Completing the square

Solving $x^2 + bx + c = 0$: $(x \pm p)^2 \pm q \pm c$, $p \neq 0$, $q \neq 0$, leading to $x = \ldots$

Method marks for differentiation and integration:

1. Differentiation

Power of at least one term decreased by 1. ($x^n \to x^{n-1}$)

2. Integration

Power of at least one term increased by 1. ($x^n \to x^{n+1}$)

Use of a formula

Where a method involves using a formula that has been learnt, the advice given in recent examiners' reports is that the formula should be quoted first.

Normal marking procedure is as follows:

Method mark for quoting a correct formula and attempting to use it, even if there are mistakes in the substitution of values.

Where the formula is not quoted, the method mark can be gained by implication from correct working with values, but will be lost if there is any mistake in the working.

Exact answers

Examiners' reports have emphasised that where, for example, an exact answer is asked for, or working with surds is clearly required, marks will normally be lost if the candidate resorts to using rounded decimals.

Answers without working

The rubric says that these may gain no credit. Individual mark schemes will give details of what happens in particular cases. General policy is that if it could be done "in your head", detailed working would not be required. Most candidates do show working, but there are occasional awkward cases and if the mark scheme does not cover this, please contact your team leader for advice.

Misreads

A misread must be consistent for the whole question to be interpreted as such.

These are not common. In clear cases, please deduct the first 2 A (or B) marks which would have been lost by following the scheme. (Note that 2 marks is the maximum misread penalty, but that misreads which alter the nature or difficulty of the question cannot be treated so generously and it will usually be necessary here to follow the scheme as written).

Sometimes following the scheme as written is more generous to the candidate than applying the misread rule, so in this case use the scheme as written.