edexcel

January 2005
6663 Core Mathematics C1
Mark Scheme

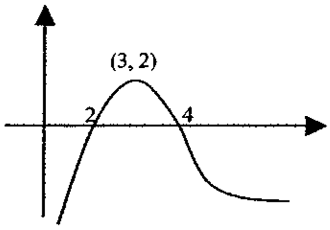
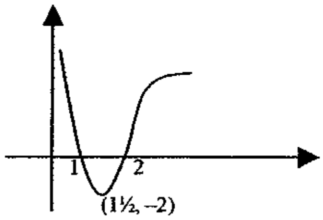
Question number	Scheme	Marks	
1.	(a) 4	B1	
	(b) $16^{-\frac{3}{2}} = \frac{1}{16^{\frac{3}{2}}}$ and attempt to find $16^{\frac{3}{2}}$	M1	
	$\frac{1}{64}$ (or exact equivalent, e.g. 0.015625)	A1	(3)
			3
	(b) <u>Any</u> attempt to evaluate $16^{\frac{3}{2}}$. Answer only scores both marks.		

Question number	Scheme		Marks
2.	(i) (a) $15x^2+7$		M1 A1 A1 (3)
	(i) (b) $30x$		B1ft (1)
	(ii) $x+2x^{\frac{3}{2}}+x^{-1}+C$	A1: $x+C$, A1: $2x^{\frac{3}{2}}$, A1: x^{-1}	M1 A1 A1 A1(4)
			8
	(i) (a) A1: 2 terms correctly differentiated. A1: Fully correct. (ii) Allow any equivalent version of each term.		

Question number	Scheme	Marks
3.	Attempt to use discriminant b^2-4ac (Need not be equated to zero)	M1
	$144-4\times k\times k=0$	A1
	Attempt to solve for k	M1
	$k=6$	A1 (4)
		4
	<u>Alternative for first 2 marks</u> Attempt to complete square $(x\pm p)^2\pm q\pm c$, $p\neq 0$, $q\neq 0$ — M1 $1-\frac{36}{k^2}=0$ or equiv. — A1 <u>Other alternatives</u> (i) $x^2+\frac{12}{k}x+1$ must be equivalent to $(x+1)^2$ — M1 A1 Compare coefficients and attempt to solve for k: $\frac{12}{k}=2$ $k=6$ — M1 A1 (ii) Finding the root first, e.g. $(\sqrt{k}x+\sqrt{k})^2=0$, so $x=-1$ — M1 A1 Substitute the root to find k, $k=6$ — M1 A1 <u>Answer only</u> Scores 2 marks: M0 A0 M1 A1 The first two marks would only be scored if solution then justifies that $k=6$ gives equal roots.	

Question number	Scheme	Marks
4.	$x^2+2(2-x)=12$ or $(2-y)^2+2y=12$ (Eqn. in x or y only)	M1
	$x^2-2x-8=0$ or $y^2-2y-8=0$ (Correct 3 term version)	A1
	$(x-4)(x+2)=0$ $x=\dots$ or $(y-4)(y+2)=0$ $y=\dots$	M1
	$x=4,\ x=-2$ or $y=4,\ y=-2$	A1
	$y=-2,\ y=4$ or $x=-2,\ x=4$ (M: attempt one, A: both)	M1 A1ft (6) **6**
	A1ft requires 3 s.f. accuracy if not exact. <u>"Non-algebraic" solutions:</u> No working, and only one correct solution pair found (e.g. $x=4, y=-2$): M0 A0 M0 A0 M1 A1 No working, and both correct solution pairs found, but not demonstrated: M0 A0 M1 A1 M1 A1 Both correct solution pairs found, and demonstrated, perhaps in a table of values: Full marks	

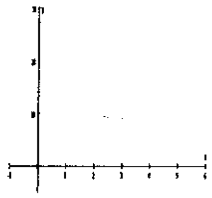
Question number	Scheme		Marks	
5.	(a) $-3,\ -1,\ 1$	B1: One correct	B1 B1	(2)
	(b) 2	(ft only if terms in (a) are in arithmetic progression)	B1ft	(1)
	(c) Sum $= \frac{1}{2}n\{2(-3)+(n-1)(2)\}$ or $\frac{1}{2}n\{(-3)+(2n-5)\}$		M1 A1ft	
	$= \frac{1}{2}n\{2n-8\} = n(n-4)$	(*)	A1	(3)
				6

Question number	Scheme		Marks	
6.	(a) 	Reflection in x-axis	B1	
		2 and 4 labelled (or (2, 0) and (4, 0) seen)	B1	
		Image of P (3, 2)	B1	(3)
	(b) 	Stretch parallel to x-axis	M1	
		1 and 2 labelled (or (1, 0) and (2, 0) seen)	A1	
		Image of P ($1\frac{1}{2}$, –2)	A1	(3)
				6

Question number	Scheme	Marks
7.	(a) $\frac{5-x}{x}=\frac{5}{x}-1 \quad \left(=5x^{-1}-1\right)$	M1
	$\frac{dy}{dx}=8x-5x^{-2}$	M1 A1 A1
	When $x=1$, $\frac{dy}{dx}=3$ (*)	A1 (5)
	(b) At $P, y=8$	B1
	Equation of tangent: $y-8=3(x-1)$ $(y=3x+5)$ (or equiv.)	M1 A1ft (3)
	(c) Where $y=0,\ x=-\frac{5}{3}$ $(=k)$ (or exact equiv.)	M1 A1 (2)
		10
	(a) First M1 can also be scored by an attempt to use the quotient or product rule to differentiate $\frac{5-x}{x}$. (b) The B mark may be earned in part (a).	

Question number	Scheme	Marks	
8.	(a) $p = 15, \quad q = -3$	B1 B1	(2)
	(b) Grad. of line *ADC*: $m = -\frac{5}{7}$, Grad. of perp. line $= -\frac{1}{m} \left(= \frac{7}{5} \right)$	B1, M1	
	Equation of *l*: $y - 2 = \frac{7}{5}(x - 8)$	M1 A1ft	
	$7x - 5y - 46 = 0$ (Allow rearrangements, e.g. $5y = 7x - 46$)	A1	(5)
	(c) Substitute $y = 7$ into equation of *l* and find $x = \ldots$	M1	
	$\frac{81}{7}$ or $11\frac{4}{7}$ (or exact equiv.)	A1	(2)
			9
	(a) <u>Special case:</u> If B0 B0 from main scheme, allow M1 for a correct method, e.g. $8 = \frac{1+p}{2}$. (b) Finding eqn. of *ADC* instead of *l* scores M1 A0 A0.		

Question number	Scheme	Marks
9.	(a) Gradient of tangent at P: $m = 4$, Grad. of normal $= -\frac{1}{m}$ $\left(= -\frac{1}{4}\right)$	B1, M1
	Equation of normal: $y - 4 = -\frac{1}{4}(x-1)$ $(4y = -x + 17)$	M1 A1 (4)
	(b) $(3x-1)^2 = 9x^2 - 6x + 1$	B1
	Integrate: $\frac{9x^3}{3} - \frac{6x^2}{2} + x$ $(+C)$	M1 A1ft
	Substitute (1, 4) to find $c = \ldots$, $c = 3$ $(y = 3x^3 - 3x^2 + x + 3)$	M1, A1 (5)
	(c) Gradient of (tangent to) C is ≥ 0	B1
	Gradient of given line is < 0 (-2)	B1 (2)
		11
	(a) Using gradient of tangent is M0. (b) <u>Alternative:</u> $y = \frac{(3x-1)^3}{9}$ $(+C)$ M1 A1 (numerator) A1 (denominator) Substitute (1, 4) to find $c = \ldots$, $c = \frac{28}{9}$ $\left(y = \frac{(3x-1)^3}{9} + \frac{28}{9}\right)$ M1, A1	

Question number	Scheme	Marks
10.	(a) $x^2 - 6x + 18 = (x-3)^2, \; +9$	B1, M1 A1 (3)
	(b)  "U"-shaped parabola	M1
	Vertex in correct quadrant	A1ft
	P: (0, 18) (or 18 on y-axis)	B1
	Q: (3, 9)	B1ft (4)
	(c) $x^2 - 6x + 18 = 41$ or $(x-3)^2 + 9 = 41$	M1
	Attempt to solve 3 term quadratic $x = \ldots$	M1
	$x = \dfrac{6 \pm \sqrt{36 - (4 \times -23)}}{2}$ (or equiv.)	A1
	$\sqrt{128} = \sqrt{64} \times \sqrt{2}$ (or equiv. surd manipulation)	M1
	$3 + 4\sqrt{2}$ (Ignore other value)	A1 (5)
		12
	(a) M1 requires $(x \pm a)^2 \pm b \pm 18,\; a \neq 0,\; b \neq 0$ Answer only: full marks.	