Mark Scheme (Results)
Summer 2008

GCE Mathematics (6663/01)

GCE

June 2008
6663 Core Mathematics C1
Mark Scheme

Question number	Scheme	Marks
1.	$2x + \frac{5}{3}x^3 + c$	M1A1A1
		(3)
		3

M1 for an attempt to integrate $x^n \to x^{n+1}$. Can be given if $+c$ is only correct term.

1st A1 for $\frac{5}{3}x^3$ or $2x + c$. Accept $1\frac{2}{3}$ for $\frac{5}{3}$. Do <u>not</u> accept $\frac{2x}{1}$ or $2x^1$ as final answer

2nd A1 for as printed (no extra or omitted terms). Accept $1\frac{2}{3}$ or $1.\dot{6}$ for $\frac{5}{3}$ but not 1.6 or 1.67 etc

Give marks for the first time correct answers are seen e.g. $\frac{5}{3}$ that later becomes 1.67, the 1.67 is treated as ISW

NB M1A0A1 is not possible

Question number	Scheme	Marks	
4. (a)	[$f'(x) =$] $3+3x^2$	M1A1	(2)
(b)	$3+3x^2 = 15$ and start to try and simplify	M1	
	$x^2 = k \to x = \sqrt{k}$ (ignore $\pm$)	M1	
	$x = 2$ (ignore $x = -2$)	A1	(3)
			5

(a)	M1 for attempting to differentiate $x^n \to x^{n-1}$. Just one term will do. A poor integration attempt that gives $3x^2 + ...$ (or similar) scores M0A0 A1 for a fully correct expression. Must be 3 not $3x^0$. If there is a + c they score A0.
(b)	1st M1 for forming a correct equation and trying to rearrange their $f'(x) = 15$ e.g. collect terms. e.g. $3x^2 = 15-3$ or $1+x^2 = 5$ or even $3+3x^2 \to 3x^2 = \frac{15}{3}$ or $3x^{-1}+3x^2 = 15 \to 6x = 15$ (i.e algebra can be awful as long as they try to collect terms in their $f'(x) = 15$ equation) 2nd M1 this is dependent upon their $f'(x)$ being of the form $a+bx^2$ and attempting to solve $a+bx^2 = 15$ For correct processing leading to $x = \ldots$ Can condone arithmetic slips but processes should be correct so e.g. $3+3x^2 = 15 \to 3x^2 = \frac{15}{3} \to x = \frac{\sqrt{15}}{3}$ scores M1M0A0 $3+3x^2 = 15 \to 3x^2 = 12 \to x^2 = 9 \to x = 3$ scores M1M0A0 $3+3x^2 = 15 \to 3x^2 = 12 \to 3x = \sqrt{12} \to x = \frac{\sqrt{12}}{3}$ scores M1M0A0

Question number	Scheme	Marks
9. (a)	$\left[\frac{dy}{dx}=\right]3kx^2-2x+1$	M1A1 (2)
(b)	Gradient of line is $\frac{7}{2}$	B1
	When $x=-\frac{1}{2}$: $3k\times\left(\frac{1}{4}\right)-2\times\left(-\frac{1}{2}\right)+1,=\frac{7}{2}$	M1, M1
	$\frac{3k}{4}=\frac{3}{2}\Rightarrow k=2$	A1 (4)
(c)	$x=-\frac{1}{2}\Rightarrow y=k\times\left(-\frac{1}{8}\right)-\left(\frac{1}{4}\right)-\frac{1}{2}-5,=-6$	M1, A1 (2)
		8
(a)	M1 for attempting to differentiate $x^n\to x^{n-1}$ (or -5 going to 0 will do) A1 all correct. A "+ c" scores A0	
(b)	B1 for $m=\frac{7}{2}$. Rearranging the line into $y=\frac{7}{2}x+c$ does not score this mark until you are sure they are using $\frac{7}{2}$ as the gradient of the line or state $m=\frac{7}{2}$ 1st M1 for substituting $x=-\frac{1}{2}$ into their $\frac{dy}{dx}$, some correct substitution seen 2nd M1 for forming a suitable equation in k and attempting to solve leading to $k=$… Equation must use their $\frac{dy}{dx}$ and their gradient of line. Assuming the gradient is 0 or 7 scores M0 unless they have clearly stated that this is the gradient of the line. A1 for $k=2$	
(c)	M1 for attempting to substitute their k (however it was found or can still be a letter) and $x=-\frac{1}{2}$ into y (some correct substitution) A1 for - 6	

Question number	Scheme	Marks	
11. (a)	$\left(x^2+3\right)^2 = x^4+3x^2+3x^2+3^2$	M1	
	$\dfrac{\left(x^2+3\right)^2}{x^2} = \dfrac{x^4+6x^2+9}{x^2} = x^2+6+9x^{-2}$ **(*)**	A1cso	(2)
(b)	$y = \dfrac{x^3}{3}+6x+\dfrac{9}{-1}x^{-1}(+c)$	M1A1A1	
	$20 = \dfrac{27}{3}+6\times 3-\dfrac{9}{3}+c$	M1	
	$c = -4$	A1	
	$[y=]\dfrac{x^3}{3}+6x-9x^{-1}-4$	A1ft	(6)
			8
(a)	M1 for attempting to expand $\left(x^2+3\right)^2$ and having at least 3(out of the 4) correct terms. A1 at least this should be seen and no incorrect working seen. If they never write $\dfrac{9}{x^2}$ as $9x^{-2}$ they score A0.		
(b)	1st M1 for some correct integration, one correct x term as printed or better Trying $\dfrac{\int u}{\int v}$ loses the first M mark but could pick up the second. 1st A1 for two correct x terms, un-simplified, as printed or better 2nd A1 for a fully correct expression. Terms need not be simplified and $+c$ is not required. No + c loses the next 3 marks 2nd M1 for using $x = 3$ and $y = 20$ in their expression for f(x) $\left[\neq \dfrac{dy}{dx}\right]$ to form a linear equation for c 3rd A1 for $c = -4$ 4th A1ft for an expression for y with simplified x terms: $\dfrac{9}{x}$ for $9x^{-1}$ is OK . Condone missing "$y =$ " Follow through their numerical value of c only.		

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June 2008
Core Mathematics C2
Mark Scheme

Question number	Scheme	Marks
8.	(a) $\left(\frac{dy}{dx}=\right)8+2x-3x^2$ (M: $x^n \to x^{n-1}$ for one of the terms, <u>not</u> just $10 \to 0$)	M1 A1
	$3x^2-2x-8=0$ $(3x+4)(x-2)=0$ $x=2$ (Ignore other solution) (*)	A1cso (3)
	(b) Area of triangle = $\frac{1}{2}\times 2\times 22$ (M: Correct method to find area of triangle)	M1 A1
	(Area = 22 with no working is acceptable)	
	$\int 10+8x+x^2-x^3\,dx = 10x+\frac{8x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}$ (M: $x^n \to x^{n+1}$ for one of the terms)	M1 A1 A1
	Only one term correct: M1 A0 A0 2 or 3 terms correct: M1 A1 A0 Integrating the <u>gradient function</u> loses this M mark.	
	$\left[10x+\frac{8x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}\right]_0^2=......$ (Substitute limit 2 into a 'changed function')	M1
	$\left(=20+16+\frac{8}{3}-4\right)$ (This M can be awarded even if the other limit is wrong)	
	Area of $R=34\frac{2}{3}-22=\frac{38}{3}\left(=12\frac{2}{3}\right)$ (Or $12.\dot{6}$)	M1 A1 (8)
	M: <u>Dependent on use of calculus in (b) and correct overall 'strategy'</u>: subtract either way round. A: Must be <u>exact</u>, not 12.67 or similar. A negative area at the end, even if subsequently made positive, loses the A mark.	
		11
	(a) The final mark may also be scored by <u>verifying</u> that $\frac{dy}{dx}=0$ at $x=2$.	
	(b) <u>Alternative</u>:	
	Eqn. of line $y=11x$. (Marks dependent on subsequent use in integration) (M1: Correct method to find equation of line. A1: Simplified form $y=11x$)	M1 A1
	$\int 10+kx+x^2-x^3\,dx = 10x+\frac{kx^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}$ (k perhaps -3)	M1 A1 A1
	$\left[10x+\frac{kx^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}\right]_0^2=......$ (Substitute limit 2 into a 'changed function')	M1
	Area of $R=\left[10x-\frac{3x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}\right]_0^2=20-6+\frac{8}{3}-4=\frac{38}{3}$ $\left(=12\frac{2}{3}\right)$	M1 A1 (8)
	Final M1 for $\int(\text{curve})-\int(\text{line})$ or $\int(\text{line})-\int(\text{curve})$.	