edexcel

Mark Scheme (Results)

Summer 2013

GCE Core Mathematics 1 (6663/01)

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information, please visit our website at www.edexcel.com.

Our website subject pages hold useful resources, support material and live feeds from our subject advisors giving you access to a portal of information. If you have any subject specific questions about this specification that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

www.edexcel.com/contactus

Pearson: helping people progress, everywhere
Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2013
Publications Code UA035658

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

EDEXCEL GCE MATHEMATICS

General Instructions for Marking

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

2. The Edexcel Mathematics mark schemes use the following types of marks:

- M marks: method marks are awarded for 'knowing a method and attempting to apply it', unless otherwise indicated.
- A marks: accuracy marks can only be awarded if the relevant method (M) marks have been earned.
- B marks are unconditional accuracy marks (independent of M marks)
- Marks should not be subdivided.

3. Abbreviations

These are some of the traditional marking abbreviations that will appear in the mark schemes:

- bod – benefit of doubt
- ft – follow through
- the symbol $\sqrt{}$ will be used for correct ft
- cao – correct answer only
- cso - correct solution only. There must be no errors in this part of the question to obtain this mark
- isw – ignore subsequent working
- awrt – answers which round to
- SC: special case
- oe – or equivalent (and appropriate)
- dep – dependent
- indep – independent
- dp decimal places
- sf significant figures
- $\ast$ The answer is printed on the paper
- The second mark is dependent on gaining the first mark

4. All A marks are 'correct answer only' (cao.), unless shown, for example, as A1 ft to indicate that previous wrong working is to be followed through. After a misread however, the subsequent A marks affected are treated as A ft, but manifestly absurd answers should never be awarded A marks.

5. 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.

6. If a candidate makes more than one attempt at any question:
    - If all but one attempt is crossed out, mark the attempt which is NOT crossed out.
    - If either all attempts are crossed out or none are crossed out, mark all the attempts and score the highest single attempt.

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

8. In some instances, the mark distributions (e.g. M1, B1 and A1) printed on the candidate's response may differ from the final mark scheme.

General Principles for Core Mathematics Marking

(But note that specific mark schemes may sometimes override these general principles).

Method mark for solving 3 term quadratic:

1. Factorisation

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

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

2. Formula

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

3. Completing the square

Solving $x^2+bx+c=0$: $\left(x\pm\frac{b}{2}\right)^2 \pm q \pm c$, $q \neq 0$, leading to x =...

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 may 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 not gain full 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.

Question Number	Scheme		Marks
1	$\dfrac{7+\sqrt{5}}{\sqrt{5}-1}\times\dfrac{(\sqrt{5}+1)}{(\sqrt{5}+1)}$	Multiplies top and bottom by a correct expression. This statement is sufficient.	M1
	(Allow to multiply top and bottom by $k(\sqrt{5}+1)$)		
	$=\dfrac{\dots}{4}$	Obtains a denominator of 4 or sight of $(\sqrt{5}-1)(\sqrt{5}+1)=4$	A1cso
	Note that M0A1 is not possible. The 4 must come from a correct method.		
	$(7+\sqrt{5})(\sqrt{5}+1)=7\sqrt{5}+5+7+\sqrt{5}$	An attempt to multiply the numerator by $(\pm\sqrt{5}\pm 1)$ and get 4 terms with at least 2 correct for their $(\pm\sqrt{5}\pm 1)$. (May be implied)	M1
	$3+2\sqrt{5}$	Answer as written or a = 3 and b = 2. (Allow $2\sqrt{5}+3$)	A1cso
	Correct answer with no working scores full marks		
			[4]
Way 2	$\dfrac{7+\sqrt{5}}{\sqrt{5}-1}\times\dfrac{(-\sqrt{5}-1)}{(-\sqrt{5}-1)}$	Multiplies top and bottom by a correct expression. This statement is sufficient.	M1
	(Allow to multiply top and bottom by $k(-\sqrt{5}-1)$)		
	$=\dfrac{\dots}{-4}$	Obtains a denominator of -4	A1cso
	$(7+\sqrt{5})(-\sqrt{5}-1)=-7\sqrt{5}-5-7-\sqrt{5}$	An attempt to multiply the numerator by $(\pm\sqrt{5}\pm 1)$ and get 4 terms with at least 2 correct for their $(\pm\sqrt{5}\pm 1)$. (May be implied)	M1
	$3+2\sqrt{5}$	Answer as written or a = 3 and $b=2$	A1cso
	Correct answer with no working scores full marks		
			[4]
	Alternative using Simultaneous Equations: $\dfrac{(7+\sqrt{5})}{\sqrt{5}-1}=a+b\sqrt{5}\Rightarrow 7+\sqrt{5}=(a-b)\sqrt{5}+5b-a$ M1 Multiplies and collects rational and irrational parts $a-b=1,\ \ 5b-a=7$ A1 Correct equations $a=3,\ b=2$ M1 for attempt to solve simultaneous equations A1 both answers correct		

Question Number	Scheme		Marks
2	$(\int =)\frac{10x^5}{5}-\frac{4x^2}{2},-\frac{3x^{\frac{1}{2}}}{\frac{1}{2}}$	M1: Some attempt to integrate: $x^n \to x^{n+1}$ on at least one term. (not for + c) (If they think $\frac{3}{\sqrt{x}}$ is $3x^{\frac{1}{2}}$ you can still award the method mark for $x^{\frac{1}{2}} \to x^{\frac{3}{2}}$	M1A1, A1
		A1: $\frac{10x^5}{5}$ **and** $\frac{-4x^2}{2}$ or better	
		A1: $-\frac{3x^{\frac{1}{2}}}{\frac{1}{2}}$ or better	
	$= \underline{2x^5 - 2x^2 - 6x^{\frac{1}{2}} + c}$	Each term correct and simplified and the + *c* all appearing together on the same line. Allow $\sqrt{x}$ for $x^{\frac{1}{2}}$. Ignore any spurious integral or signs and/or d*y*/d*x*'s.	A1
	Do **not** apply isw. If they obtain the correct answer and then e.g. divide by 2 they lose the last mark.		
			[4]

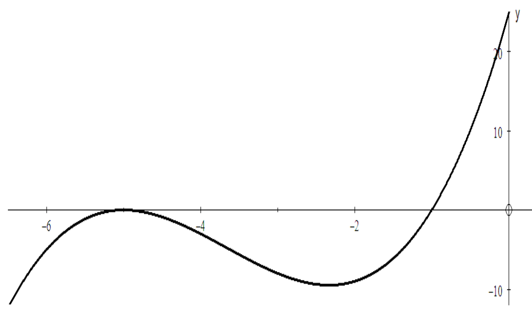
Question Number	Scheme		Marks
3(a)	$8^{\frac{1}{3}} = 2$ or $8^5 = 32768$	A correct attempt to deal with the $\frac{1}{3}$ or the 5. $8^{\frac{1}{3}} = \sqrt[3]{8}$ or $8^5 = 8\times8\times8\times8\times8$	M1
	$\left(8^{\frac{5}{3}} =\right)$ 32	Cao	A1
	A correct answer with no working scores full marks		
	Alternative $8^{\frac{5}{3}} = 8\times 8^{\frac{2}{3}} = 8\times 2^2 =$ M1 (Deals with the 1/3) $= 32$ A1		
			(2)
(b)	$\left(2x^{\frac{1}{2}}\right)^3 = 2^3 x^{\frac{3}{2}}$	One correct power either 2^3 or $x^{\frac{3}{2}}$. $\left(2x^{\frac{1}{2}}\right)\times\left(2x^{\frac{1}{2}}\right)\times\left(2x^{\frac{1}{2}}\right)$ on its own is not sufficient for this mark.	M1
	$\dfrac{8x^{\frac{3}{2}}}{4x^2} = 2x^{-\frac{1}{2}}$ or $\dfrac{2}{\sqrt{x}}$	M1: Divides coefficients of x **and** subtracts their powers of x. **Dependent on the previous M1**	dM1A1
		A1: Correct answer	
	Note that unless the power of x implies that they have subtracted their powers you would need to see evidence of subtraction. E.g. $\dfrac{8x^{\frac{3}{2}}}{4x^2} = 2x^{\frac{1}{2}}$ would score dM0 unless you see some evidence that 3/2 – 2 was intended for the power of x.		
	Note that there is a misconception that $\dfrac{\left(2x^{\frac{1}{2}}\right)^3}{4x^2} = \left(\dfrac{2x^{\frac{1}{2}}}{4x^2}\right)^3$ - this scores 0/3		
			(3)
			[5]

Question Number	Scheme		Marks
	For this question, mark (a) and (b) together and ignore labelling.		
4(a)	$(a_2 =)\ k(4+2)\ \ (=6k)$	Any correct (possibly un-simplified) expression	B1
			(1)
(b)	$a_3 = k(\text{their } a_2 + 2)\ (= 6k^2 + 2k)$	An attempt at a_3. Can follow through their answer to (a) but a_2 must be an expression in *k*.	M1
	$a_1 + a_2 + a_3 = 4 + (6k) + (6k^2 + 2k)$	An attempt to find their $a_1 + a_2 + a_3$	M1
	$4 + (6k) + (6k^2 + 2k) = 2$	A **<u>correct</u>** equation in any form.	A1
	Solves $6k^2 + 8k + 2 = 0$ to obtain $k =$ $(6k^2 + 8k + 2 = 2(3k+1)(k+1))$	Solves their 3TQ as far as $k = ...$ according to the general principles. (An independent mark for solving their three term quadratic)	M1
	$k = -1/3$	Any equivalent fraction	A1
	$k = -1$	Must be from a correct equation. (Do not accept un-simplified)	B1
	Note that it is quite common to think the sequence is an AP. Unless they find a_3, this is likely only to score the M1 for solving their quadratic.		
			(6)
			[7]

Question Number	Scheme		Marks
5 (a)	$6x + x > 1 - 8$	Attempts to expand the bracket and collect x terms on one side and constant terms on the other. Condone sign errors and allow one error in expanding the bracket. Allow $<$, $\le$, $\ge$, $=$ instead of $>$.	M1
	$x > -1$	Cao	A1
	Do not isw here, mark their final answer.		
			(2)
(b)	$(x+3)(3x-1)[=0]$ $\Rightarrow x = -3$ and $\frac{1}{3}$	M1: Attempt to solve the quadratic to obtain two critical values A1: $x = -3$ **and** $\frac{1}{3}$ (may be implied by their inequality). Allow all equivalent fractions for -3 and 1/3. (Allow 0.333 for 1/3)	M1A1
	$-3 < x < \frac{1}{3}$	M1: Chooses "inside" region (The letter x does not need to be used here) A1ft: Allow $x < \frac{1}{3}$ **and** $x > -3$ or $\left(-3, \frac{1}{3}\right)$ or $x < \frac{1}{3} \cap x > -3$. Follow through their critical values. (must be in terms of x here) Allow all equivalent fractions for -3 and 1/3. Both ($x < \frac{1}{3}$ **or** $x > -3$) and ($x < \frac{1}{3}$**,** $x > -3$) as a final answer score A0.	M1A1ft
			(4)
			[6]
	Note that use of $\le$ or $\ge$ appearing in an otherwise correct answer in (a) or (b) should only be penalised once, the first time it occurs.		

Question Number	Scheme		Marks
6	(-1, 3) , (11, 12)		
(a)	$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{12-3}{11-(-1)}, = \dfrac{3}{4}$	M1:Correct method for the gradient A1: Any correct fraction or decimal	M1,A1
	$y - 3 = ¾\,(x+1)$ or $y - 12 = ¾\,(x - 11)$ or $y = ¾\,x + c$ with attempt at substitution to find c	Correct straight line method using either of the given points and a numerical gradient.	M1
	$4y - 3x - 15 = 0$	Or equivalent with integer coefficients (= 0 **is** required)	A1
	This A1 should only be awarded in (a)		
			(4)
(a) Way 2	$\dfrac{y - y_1}{y_2 - y_1} = \dfrac{x - x_1}{x_2 - x_1} \Rightarrow \dfrac{y-3}{12-3} = \dfrac{x+1}{11+1}$	M1: Use of a correct formula for the straight line A1: Correct equation	M1A1
	$12(y-3) = 9(x+1)$	Eliminates fractions	M1
	$4y - 3x - 15 = 0$	Or equivalent with integer coefficients (= 0 **is** required)	A1
			(4)
(b)	Solves their equation from part (a) and L_2 simultaneously to eliminate one variable	Must reach as far as an equation in x only or in y only. (Allow slips in the algebra)	M1
	$x = 3$ or $y = 6$	One of $x = 3$ or $y = 6$	A1
	Both $x = 3$ **and** $y = 6$	Values can be un-simplified fractions.	A1
	Fully correct answers with no working can score 3/3 in (b)		
			(3)
(b) Way 2	$(-1,3) \to -a + 3b + c = 0$ $(11,12) \to 11a + 12b + c = 0$	Substitutes the coordinates to obtain two equations	M1
	$\therefore a = -\dfrac{3}{4}b,\ b = -\dfrac{4}{15}c$	Obtains sufficient equations to establish values for a, b and c	A1
	e.g. $c = 1 \Rightarrow b = -\dfrac{4}{15},\ a = \dfrac{3}{15}$	Obtains values for a, b and c	M1
	$\dfrac{3}{15}x - \dfrac{4}{15}y + 1 = 0 \Rightarrow 4y - 3x - 15 = 0$	Correct equation	A1
			(4)
			[7]

Question Number	Scheme		Marks
7(a)	$600 = 200 + (N - 1)20 \Rightarrow N = ...$	Use of 600 with a **correct** formula in an attempt to find N. A correct formula could be implied by a correct answer.	M1
	$N = 21$	cso	A1
	Accept correct answer only.		
	$600 = 200 + 20\text{N} \Rightarrow N = 20$ is M0A0 (wrong formula) $\frac{600-200}{20} = 20 \therefore N = 21$ is M1A1 (correct formula implied)		
	Listing: All terms must be listed up to 600 and 21 correctly identified. A solution that scores 2 if fully correct and 0 otherwise.		
			(2)
(b)	**Look for an AP first:**		
	$S = \frac{21}{2}(2\times 200 + 20\times 20)$ or $\frac{21}{2}(200+600)$ or $S = \frac{20}{2}(2\times 200 + 19\times 20)$ or $\frac{20}{2}(200+580)$ (= 8400 or 7800)	M1: Use of correct sum formula with their **integer** $n = N$ or $N - 1$ from part (a) where $3 < N < 52$ and $a = 200$ and $d = 20$. A1: Any correct un-simplified numerical expression with $n = 20$ or $n = 21$ (No follow through here)	M1A1
	Then for the constant terms:		
	$600\times(52 - "N")$ (= 18600)	M1: $600\times k$ where k is an integer and $3 < k < 52$ A1: A correct un-simplified follow through expression with their k consistent with n so that $n + k = 52$	M1A1ft
	So total is 27000	Cao	A1
	Note that for the constant terms, they may correctly use an AP sum with $d = 0$.		
	There are no marks in (b) for just finding S_{52}		
			(5)
			[7]
	If they obtain $N = 20$ in (a) (0/2) and then in (b) proceed with, $S = \frac{20}{2}(2\times 200 + 19\times 20) + 32\times 600 = 7800 + 19\ 200 = 27\ 000$ allow them to 'recover' and score full marks in (b) Similarly If they obtain $N = 22$ in (a) (0/2) and then in (b) proceed with, $S = \frac{21}{2}(2\times 200 + 20\times 20) + 31\times 600 = 8400 + 18\ 600 = 27\ 000$ allow them to 'recover' and score full marks in (b)		

Question Number	Scheme		Marks
8 **(a)**		Horizontal translation – does **not** have to cross the y-axis on the right but must at least reach the x-axis.	B1
		Touching at (-5, 0). This could be stated anywhere or -5 could be marked on the x-axis. Or (0, -5) **marked in the correct place.** Be fairly generous with 'touching' if the intention is clear.	B1
		The right hand tail of their cubic shape crossing at (-1, 0). This could be stated anywhere or -1 could be marked on the x-axis. Or (0, -1) **marked in the correct place.** The curve must **cross** the x-axis and not stop at -1.	B1
			(3)
(b)	$(x+5)^2(x+1)$	Allow $(x+3+2)^2(x-1+2)$	B1
			(1)
(c)	When $x = 0$, $y = 25$	M1: Substitutes $x = 0$ into their expression in **part (b)** which is not f(x). This may be implied by their answer. Note that the question asks them to use part (b) but allow independent methods.	M1 A1
		A1: $y = 25$ (Coordinates not needed)	
	If they expand <u>incorrectly</u> prior to substituting x = 0, score M1 A0 NB **f(x + 2) =** $x^3 + 11x^2 + 35x + 25$		
			(2)
			[6]

Question Number	Scheme		Marks
9 (a)	$(3-x^2)^2 = 9-6x^2+x^4$	An attempt to expand the numerator obtaining an expression of the form $9 \pm px^2 \pm qx^4, \quad p,q \neq 0$	M1
	$9x^{-2}+x^2$	Must come from $\dfrac{9+x^4}{x^2}$	A1
	-6	Must come from $\dfrac{-6x^2}{x^2}$	A1
	Alternative 1: Writes $\dfrac{(3-x^2)^2}{x^2}$ as $(3x^{-1}-x)^2$ and attempts to expand = M1 then A1A1 as in the scheme.		
	Alternative 2: Sets $(3-x^2)^2 = 9+Ax^2+Bx^4$, expands $(3-x^2)^2$ and compares coefficients = M1 then A1A1 as in the scheme.		
			(3)
	$(\mathrm{f}'(x) = 9x^{-2}-6+x^2)$		
(b)	$-18x^{-3}+2x$	M1: $x^n \to x^{n-1}$ on separate terms at least once. Do not award for $A \to 0$ (Integrating is M0) A1ft: $-18x^{-3}+2\text{"}B\text{"}x$ with a numerical B and no extra terms. (A may have been incorrect or even zero)	M1 A1ft
			(2)
(c)	$\mathrm{f}(x) = -9x^{-1}-6x+\dfrac{x^3}{3}(+c)$	M1: $x^n \to x^{n+1}$ on separate terms at least once. (Differentiating is M0) A1ft: $-9x^{-1}+Ax+\dfrac{Bx^3}{3}(+c)$ with numerical A and B, $A,B \neq 0$	M1A1ft
	$10 = \dfrac{-9}{-3}-6(-3)+\dfrac{(-3)^3}{3}+c$ so c = ...	Uses x = -3 and y =10 in what they think is f(x) (They may have differentiated here) but it must be a changed function i.e. not the original $\mathrm{f}'(x)$, to form a linear equation in c and attempts to find c. No + c gets M0 and A0 unless their method implies that they are correctly finding a constant.	M1
	c = -2	cso	A1
	$(\mathrm{f}(x) =) -9x^{-1}-6x+\dfrac{x^3}{3}+$ their c	Follow through their c in an otherwise (possibly un-simplified) **correct expression**. Allow $-\dfrac{9}{x}$ for $-9x^{-1}$ or even $\dfrac{9x^{-1}}{-1}$.	A1ft
	Note that if they integrate in (b), no marks there but if they then go on to use their integration in (c), the marks for integration are available.		
			(5)
			[10]

Question Number	Scheme	Marks	
10(a)	$x^2 - 4k(1-2x) + 5k (= 0)$	Makes y the subject from the first equation and substitutes into the second equation (= 0 not needed here) or eliminates y by a correct method.	M1
	So $x^2 + 8kx + k = 0$ *	Correct completion to printed answer. There must be no incorrect statements.	A1cso
			(2)
(b)	$(8k)^2 - 4k$	M1: <u>Use</u> of $b^2 - 4ac$ (Could be in the quadratic formula or an inequality, = 0 not needed yet). There must be some correct substitution but there must be no x's. No formula quoted followed by e.g. $8k^2 - 4k = 0$ is M0. A1: Correct expression. Do not condone missing brackets unless they are implied by later work but can be implied by $(8k)^2 > 4k$ etc.	M1 A1
	$k = \frac{1}{16}$ (oe)	Cso (Ignore any reference to $k = 0$) but there must be no contradictory earlier statements. A fully correct solution with no errors.	A1
			(3)
(b) Way 2 Equal roots	$\Rightarrow x^2 + 8kx + k = (x + \sqrt{k})^2$ $\Rightarrow 8k = 2\sqrt{k}$	M1: Correct strategy for equal roots A1: Correct equation	M1A1
	$k = \frac{1}{16}$ (oe)	Cso (Ignore any reference to $k = 0$)	A1
(b) Way 3	Completes the Square $x^2 + 8kx + k = (x+4k)^2 - 16k^2 + k$ $\Rightarrow 16k^2 - k = 0$	M1: $(x \pm 4k)^2 \pm p \pm k,\ p \neq 0$ A1: Correct equation	M1A1
	$k = \frac{1}{16}$ (oe)	Cso (Ignore any reference to $k = 0$)	A1
			(3)
(c)	$x^2 + \frac{1}{2}x + \frac{1}{16} = 0$ so $(x + \frac{1}{4})^2 = 0 \Rightarrow x =$	Substitutes their value of k into the given quadratic and attempt to solve their 2 or 3 term quadratic as far as $x =$ (may be implied by substitution into the quadratic formula) or starts again and substitutes their value of k into the second equation and solves simultaneously to obtain a value for x.	M1
	$x = -\frac{1}{4}$, $y = 1\frac{1}{2}$	First A1 one answer correct, second A1 both answers correct.	A1A1
	Special Case: $x^2 + \frac{1}{2}x + \frac{1}{16} = 0 \Rightarrow x = -\frac{1}{4},\ \frac{1}{4} \Rightarrow y = 1\frac{1}{2},\ \frac{1}{2}$ allow M1A1A0		
			(3)
			[8]

Question Number	Scheme		Marks
11 (a)	$\left(-\frac{3}{4}, 0\right)$. Accept $x = -\frac{3}{4}$		B1
			(1)
(b)	$y = 4$	B1: One correct asymptote	B1B1
	$x = 0$ or 'y-axis'	B1: Both correct asymptotes and no extra ones.	
	Special case $x \neq 0$ **and** $y \neq 4$ scores B1B0		
			(2)
(c)	$\frac{dy}{dx} = -3x^{-2}$	$\frac{dy}{dx} = kx^{-2}$ (Allow $\frac{dy}{dx} = kx^{-2} + 4$)	M1
	At $x = -3$, gradient of curve = $-\frac{1}{3}$	Cao (may be un-simplified but must be a fraction with no powers) e.g. $-3(-3)^{-2}$ scores A0 unless evaluated as e.g. $\frac{-3}{9}$ or is implied by their normal gradient.	A1
	Gradient of normal = -1/m	Correct perpendicular gradient rule applied to a numerical gradient that must have come from substituting x = -3 into their derivative. **Dependent on the previous M1.**	dM1
	Normal at P is $(y-3) = 3(x+3)$	M1: Correct straight line method using (-3, 3) and a "changed" gradient. A wrong equation with no formula quoted is M0. **Also dependent on the first M1.**	dM1A1
		A1: Any correct equation	
			(5)
(d)	(-4, 0) and (0, 12).	Both correct (May be seen on a sketch)	B1
	So AB has length $\sqrt{160}$ or AB^2 has length 160	M1: Correct use of Pythagoras for their A and B one of which lies on the x-axis and the other on the y-axis, obtained from their equation in (c). A correct method for AB^2 or AB.	M1 A1cso
		A1: $\sqrt{160}$ or better e.g. $4\sqrt{10}$ **with no errors seen**	
			(3)
			[11]

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467
Fax 01623 450481
Email publication.orders@edexcel.com

Order Code UA035658 Summer 2013

For more information on Edexcel qualifications, please visit our website
www.edexcel.com

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE

Ofqual

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

cea
Rewarding Learning