OCR
Oxford Cambridge and RSA

GCE

Mathematics B (MEI)

H640/02: Pure Mathematics and Statistics

Advanced GCE

Mark Scheme for November 2020

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Text Instructions

Annotations and abbreviations

Annotation in scoris	Meaning
✓and ✗	
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working
M0, M1	Method mark awarded 0, 1
A0, A1	Accuracy mark awarded 0, 1
B0, B1	Independent mark awarded 0, 1
E	Explanation mark 1
SC	Special case
^	Omission sign
MR	Misread
BP	Blank page
Highlighting	
Other abbreviations in mark scheme	**Meaning**
E1	Mark for explaining a result or establishing a given result
dep*	Mark dependent on a previous mark, indicated by *. The * may be omitted if only previous M mark.
cao	Correct answer only
oe	Or equivalent
rot	Rounded or truncated
soi	Seen or implied
www	Without wrong working
AG	Answer given
awrt	Anything which rounds to
BC	By Calculator
DR	This indicates that the instruction **In this question you must show detailed reasoning** appears in the question.

Subject-specific Marking Instructions for AS Level Mathematics B (MEI)

a Annotations must be used during your marking. For a response awarded zero (or full) marks a single appropriate annotation (cross, tick, M0 or ^) is sufficient, but not required.

For responses that are not awarded either 0 or full marks, you must make it clear how you have arrived at the mark you have awarded and all responses must have enough annotation for a reviewer to decide if the mark awarded is correct without having to mark it independently.

It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.

Award NR (No Response)

- if there is nothing written at all in the answer space and no attempt elsewhere in the script
- OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
- OR if there is a mark (e.g. a dash, a question mark, a picture) which isn't an attempt at the question.

Note: Award 0 marks only for an attempt that earns no credit (including copying out the question).

If a candidate uses the answer space for one question to answer another, for example using the space for 8(b) to answer 8(a), then give benefit of doubt unless it is ambiguous for which part it is intended.

b An element of professional judgement is required in the marking of any written paper. Remember that the mark scheme is designed to assist in marking incorrect solutions. Correct solutions leading to correct answers are awarded full marks but work must not always be judged on the answer alone, and answers that are given in the question, especially, must be validly obtained; key steps in the working must always be looked at and anything unfamiliar must be investigated thoroughly. Correct but unfamiliar or unexpected methods are often signalled by a correct result following an apparently incorrect method. Such work must be carefully assessed. When a candidate adopts a method which does not correspond to the mark scheme, escalate the question to your Team Leader who will decide on a course of action with the Principal Examiner.
If you are in any doubt whatsoever you should contact your Team Leader.

c The following types of marks are available.

M
A suitable method has been selected and *applied* in a manner which shows that the method is essentially understood. Method marks are not usually lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, e.g. by substituting the relevant quantities into the formula. In some cases the nature of the errors allowed for the award of an M mark may be specified.
A method mark may usually be implied by a correct answer unless the question includes the DR statement, the command words "Determine" or "Show that", or some other indication that the method must be given explicitly.

A
Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated Method mark is earned (or implied). Therefore M0 A1 cannot ever be awarded.

B
Mark for a correct result or statement independent of Method marks.

E
A given result is to be established or a result has to be explained. This usually requires more working or explanation than the establishment of an unknown result.

Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored. Sometimes this is reinforced in the mark scheme by the abbreviation isw. However, this would not apply to a case where a candidate passes through the correct answer as part of a wrong argument.

d When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. (The notation 'dep*' is used to indicate that a particular mark is dependent on an earlier, asterisked, mark in the scheme.) Of course, in practice it may happen that when a candidate has once gone wrong in a part of a question, the work from there on is worthless so that no more marks can sensibly be given. On the other hand, when two or more steps are successfully run together by the candidate, the earlier marks are implied and full credit must be given.

e The abbreviation FT implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A and B marks are given for correct work only – differences in notation are of course permitted. A (accuracy) marks are not given for answers obtained from incorrect working. When A or B marks are awarded for work at an intermediate stage of a solution, there may be various alternatives that are equally acceptable. In such cases, what is acceptable will be detailed in the mark scheme. If this is not the case, please escalate the question to your Team Leader who will decide on a course of action with the Principal Examiner.
Sometimes the answer to one part of a question is used in a later part of the same question. In this case, A marks will often be 'follow through'. In such cases you must ensure that you refer back to the answer of the previous part question even if this is not shown within the image zone. You may find it easier to mark follow through questions candidate-by-candidate rather than question-by-question.

f Unless units are specifically requested, there is no penalty for wrong or missing units as long as the answer is numerically correct and expressed either in SI or in the units of the question. (e.g. lengths will be assumed to be in metres unless in a particular question all the lengths are in km, when this would be assumed to be the unspecified unit.)
We are usually quite flexible about the accuracy to which the final answer is expressed; over-specification is usually only penalised where the scheme explicitly says so.

- When a value is **given** in the paper only accept an answer correct to at least as many significant figures as the given value.
- When a value is **not given** in the paper accept any answer that agrees with the correct value to **2 s.f.** unless a different level of accuracy has been asked for in the question, or the mark scheme specifies an acceptable range.
  NB for Specification A the rubric specifies 3 s.f. as standard, so this statement reads "3 s.f"

Follow through should be used so that only one mark in any question is lost for each distinct accuracy error.
Candidates using a value of 9.80, 9.81 or 10 for *g* should usually be penalised for any final accuracy marks which do not agree to the value found with 9.8 which is given in the rubric.

g Rules for replaced work and multiple attempts:

- If one attempt is clearly indicated as the one to mark, or only one is left uncrossed out, then mark that attempt and ignore the others.
- If more than one attempt is left not crossed out, then mark the last attempt unless it only repeats part of the first attempt or is substantially less complete.
- if a candidate crosses out all of their attempts, the assessor should attempt to mark the crossed out answer(s) as above and award marks appropriately.

h For a genuine misreading (of numbers or symbols) which is such that the object and the difficulty of the question remain unaltered, mark according to the scheme but following through from the candidate's data. A penalty is then applied; 1 mark is generally appropriate, though this may differ for some units. This is achieved by withholding one A or B mark in the question. Marks designated as cao may be awarded as long as there are no other errors. If a candidate corrects the misread in a later part, do not continue to follow through. E marks are lost unless, by chance, the given results are established by equivalent working. Note that a miscopy of the candidate's own working is not a misread but an accuracy error.

i If a calculator is used, some answers may be obtained with little or no working visible. Allow full marks for correct answers provided that there is nothing in the wording of the question specifying that analytical methods are required such as the bold "In this question you must show detailed reasoning", or the command words "Show" and "Determine. Where an answer is wrong but there is some evidence of method, allow appropriate method marks. Wrong answers with no supporting method score zero. If in doubt, consult your Team Leader.

j If in any case the scheme operates with considerable unfairness consult your Team Leader.

Question			Answer	Marks	AOs		Guidance
1			$\frac{1}{2} \times 22.1 \times 18.0 \times \sin 133^\circ$ 145 **cao**	**M1** **A1** **[2]**	**1.1a** **1.1**	or $\frac{1}{2} \times 18.0 \times 36.8 \times \sin 26^\circ$ or $\frac{1}{2} \times 22.1 \times 36.8 \times \sin 21^\circ$ ignore units	**NB** 172.8 or 173 unsupported implies **M1**
2	(a)		16.8 or 17 **cao**	**B1** **[1]**	**1.1**	ignore units	
2	(b)		$\frac{1}{2} \times 8^2 \times 2.1$ 67.2 or 67 **cao**	**M1** **A1** **[2]**	**1.1a** **1.1**	or $\frac{\theta^\circ}{360} \times \pi \times 8^2$ ignore units	$\theta = 120 - 120.3211\ldots$
3	(a)		$4 + 8\cos 8x$	**M1*** **A1** **[2]**	**1.1** **1.1**	differentiation with either term correct all correct	
3	(b)		attempt to solve their $4 + 8\cos 8x = 0$ $\frac{\pi}{12}$ **isw cao**	**M1dep*** **A1** **[2]**	**1.1** **1.1**	one intermediate step seen	
4	(a)		$23 \leq m \leq 29$	**B1** **[1]**	**1.1**		
4	(b)		no, p% spent less than an hour revising maths; or no, 90% spent less than m minutes revising maths	**B1** **[1]**	**2.4**	$75 \leq p \leq 85$ $75 \leq m \leq 100$	Allow eg x out of 200 is not 90% or 0.9 oe where $150 \leq x \leq 170$

Question			Answer	Marks	AOs		Guidance
5	(a)		26	**B1** **[1]**	**1.1**	**NB** $17 + (n-1) \times 11 = 292$	
5	(b)		$\frac{their\ 26}{2} \times (17 + 292)$ oe 4017	**M1** **A1** **[2]**	**1.1** **1.1**	$\frac{their\ 26}{2} \times (2 \times 17 + (their\ 26 - 1) \times 11)$	
6	(a)		$1 + \left(\frac{1}{2}\right)(4x) + \left(\frac{1}{2}\right)\left(-\frac{1}{2}\right)\frac{(4x)^2}{2!}$ $1 + 2x - 2x^2$ **isw cao**	**M1** **A1** **A1** **[3]**	**2.1** **1.1** **1.1**	ignore extra terms, allow one error two of three terms correct all three terms correct, ignore extra terms	if **M0** allow **SC2** for 2 of first three terms correct
6	(b)		$\lvert x \rvert < \frac{1}{4}$ **oe**	**B1** **[1]**	**1.1**	or $\lvert x \rvert \leq$ ¼ **oe**	
7	(a)		$0.6 + 0.5 - \mathrm{P}(A \cap B) = 1 - 0.2$ **oe soi** $= 0.3$	**M1** **A1** **[2]**	**1.1a** **1.1**	or **M1** for probabilities in bold correct in table or marked correctly on Venn diagram **NB** 0.3 from 0.6×0.5 does not score	<table><tr><td></td><td>A</td><td>$\sim A$</td><td></td></tr><tr><td>B</td><td>0.3</td><td>0.2</td><td>**0.5**</td></tr><tr><td>$\sim B$</td><td>0.3</td><td>**0.2**</td><td>0.5</td></tr><tr><td></td><td>**0.6**</td><td>0.4</td><td>1</td></tr></table>
7	(b)		$\frac{0.3}{0.5}$ $= 0.6$	**M1** **A1** **[2]**	**1.1** **1.1**	$\frac{\text{their P}(A \cap B)}{0.5}$	

Question			Answer	Marks	AOs		Guidance
7	(c)		independent since p(A) = p(A/B) oe	**B1** **[1]**	**2.4**	or 0.6×0.5 = 0.3 or P($A \cap B$) = P(A) × P(B)	**FT** *their* values with correct argument
8	(a)		Quota sampling	**B1** **[1]**	**1.2**		
8	(b)		9	**B1** **[1]**	**1.1**	from 5 × 1.8	
8	(c)		Systematic: select every 24th number on the list	**M1**	**2.4**	*alternatively* select every 25th number on the list	*alternatively* select every 24.8th value on list, rounding as appropriate
			start randomly between n = 1 and $n \geq 184$ and stop when 200 have been selected (if $n > 184$, must cycle through list)	**A1**	**1.1**	start randomly between n = 1 and $n \geq 25$, and cycle through the list again, stopping when 200 have been selected	start randomly with any value on list. Cycle through the list repeatedly until 200 items have been selected
			Simple random sampling: *alternatively* assign each item in the list a unique number (eg from 1 to 4960)	**E1**	**2.4**	allow any process where each member of the population has an equal chance of being selected	
			generate random numbers until a sample of 200 has been selected **soi**	**E1** **[4]**	**1.1**	allow any process where each possible sample has an equal chance of being selected	

Question			Answer	Marks	AOs		Guidance
8	(d)		as the size of the sample increases, the shape of the distribution appears more and more "Normal" **oe**	**B1** **[1]**	**2.4**	must refer to shape **and** closer to Normal shape for larger sample	
8	(e)		use of N(60.0515, 6.5783^2) to find P($X > 65$) awrt 0.23 4960 × their 0.226 1121 or 1120 or 1119	**M1** **A1** **M1** **A1** **[4]**	**3.3** **3.4** **3.1b** **3.5a**	condone use of 6.5717^2 or parameters rounded to 3 sf	**M0** if continuity correction used or eg P($X > 64$) found
8	(f)		eg there may be seasonal fluctuations such as teachers retiring in August	**B1** **[1]**	**3.5b**	allow any sensible reason in context	do not allow eg mean and sd may be different
9	(a)		eg randomly select N different businesses and then randomly select P computers from each business; may be implied by correct description	**B1** **[1]**	**2.4**	$N \times P = 120$ where N and P are integers greater than 1.	eg 20 and 6 or 15 and 8

Question			Answer	Marks	AOs		Guidance
9	(b)		H_0: $\mu = 5$ **oe** H_1: $\mu \neq 5$ **oe**	**B1**	**1.1**	allow any parameter apart from $\bar{x}$ for population mean as long as clearly defined as (population) mean	after **B** marks **M1A1M1A1A1** may be earned if working with 2.7054 rounded to 2 or more sf
			H_1 takes this form as Claud is testing whether the mean length of time is different to 5 **oe**	**B1**	**2.4**		
			μ is the **population** mean time for which computers are kept before being replaced	**B1**	**2.5**		
			use of N(5, $\frac{2.7054^2}{120}$) to find P($\bar{X} < 4.8855$) or invNorm(p,5, $\frac{2.7054}{\sqrt{120}}$) where $p = 0.025$ or 0.05; may be implied by 0.3215 or 4.51595…or 4.59377…	**M1**	**3.3**	condone use of 2.6941 (may be rounded) instead of 2.7054 for **M1**, may be implied by 0.32076 or CR is $\bar{X} < 4.51797..$, but **A1** not available	or $z = \frac{4.8855 - 5}{\frac{2.7054}{\sqrt{120}}}$ for **M1** awrt − 0.46 **A1** (may be implied by –0.466 or –0.465567.. if 2.6941 used)
			P($\bar{X}$< 4.8855) = awrt 0.32	**A1**	**1.1**	or CR is $(\bar{X}) < 4.5 - 4.6$	
			0.32 > 0.025 or 4.8855 > 4.5(2)	**M1**	**3.4**	comparison of *their* probability with 0.025 **or** comparison of 4.8855 with *their* critical value from use of 0.025, as long as previous **M1** awarded	*their* − 0.4436 > – 1.96 **oe** **M1** dep on award of previous **M1**
			not significant or accept H_0 or do not reject H_0 or reject H_1	**A1FT**	**1.1**	may be embedded in conclusion in context	
			insufficient evidence to **suggest** (at 5% level) that the (population) **mean** length of time (computers are kept) is not 5 years	**A1FT**	**2.2b**		do not allow eg conclude / prove / indicate or other assertive statement instead of suggest; **A0** if answer spoiled
				[8]			

Question			Answer	Marks	AOs		Guidance
10	(a)		$\sin 2x \approx 2x$ or $\sin x \approx x$ used	M1	3.1a	may see $\cos x \approx 1 - \frac{x^2}{2}$	
			$\int \left(\frac{1}{x}\right) dx$ or $\int \left(\frac{1}{x} - x\right) dx$ obtained **oe nfww**	A1	1.1		
			F[x] = ln$x$ **oe** or F[x] = ln$x$ – ½ x^2 **oe**	A1	1.1	intermediate step needed from here to earn final mark	
			ln(0.05) – ln(0.01) = ln5 **oe** or ln(0.05) – ln(0.01) + 0.0012 ≈ ln5 **oe**	A1 [4]	3.2a		
10	(b)		differentiation of *their* $\frac{1}{x}$	M1	2.1	or differentiation of y using quotient rule and use of small angle approximation	
			substitution of 0.01 and – 10 000 correctly obtained	A1 [2]	1.1	from $-\frac{1}{x^2}$ or $-\frac{1}{x^2} - 1$ **oe**	
10	(c)		4.54066×10^{-6} or 0.00000454066 **cao**	B1	2.5		
			(no sign change for 6 dp), but sign change for 5 dp or last two iterates agree to 5dp	E1	3.1a	allow sign change between 0.947745 and 0.9477475	
			0.94775	B1 [3]	3.2a		

Question			Answer	Marks	AOs		Guidance
11	(a)		house prices are generally higher in London boroughs (than elsewhere in the country), so Dr Procter's suggestion is probably wrong	**B1** **[1]**	**2.2a**		
11	(b)		214 505 219 402	**B1** **B1** **[2]**	**3.4** **1.1**		
11	(c)		$P = 28\,500Y - 57\,184\,000$ (where Y is the calendar year) or $P = 28\,500y + 215\,000$ (where y is the number of years after 2014)	**B1** **B1** **[2]**	**3.3** **1.1**	gradient intercept	allow both marks for correct equation in any form **isw** allow eg $y = 28\,500x - 57\,184\,000$
11	(d)		2016 272 000 2017 300 500	**B1** **B1** **[2]**	**3.4** **1.1**		**FT** *their* straight line model provided this gives values > 250 000
11	(e)		Dr Procter's model is a (very) poor fit Prof Jackson's is a good fit, or works well for 2017, but not 2016	**B1** **B1** **[2]**	**2.2a** **2.2a**	dependent on correct values in (b) **FT** comment for *their* values > 250 000	 this mark is dependent on having calculated values in part **(d)**
11	(f)		neither – extrapolation **oe**	**B1** **[1]**	**3.5b**		

Question			Answer	Marks	AOs		Guidance
12	(a)		$2p + q + 0.2 + 0.3 = 1$ **soi oe**	**B1**	**2.1**		
			$2 \times p \times q = 0.06$ **soi**	**M1**	**3.1a**	allow **M1** if 2 omitted	
			eliminate p or q with a correct substitution from one of *their* equations	**M1**	**1.1**		
			$q^2 - 0.5q + 0.06 = 0$ or $2p^2 - 0.5p + 0.03 = 0$ **oe**	**A1**	**1.1**	eg $2 \times \frac{0.03}{q} + q = 0.5$ or $2p + \frac{0.03}{p} = 0.5$	**NB** if 2 omitted, **A0** for $2p^2 - 0.5p + 0.6 = 0$ or $2q^2 + q + 0.24 = 0$ which have no real roots
			$q = 0.2$ or 0.3 **and** $p = 0.15$ or 0.1	**A1**	**1.1**	may be implied by eg $q = 0.2$ or 0.3 **and** $2p = 0.3$ or 0.2	
			($q < 2p$ so) $q = 0.2$ and $p = 0.15$	**A1**	**3.2a**		
				[6]			
12	(b)		$10 \times q \times (1 - q)^9$ **soi**	**M1**	**1.1**		
			0.27 or 0.268 or awrt 0.2684 **isw**	**A1**	**1.1**	**FT** *their* q where $0 < q < 1$	
				[2]			

Question			Answer	Marks	AOs		Guidance
12	(c)		H_0: $p = 0.2$ H_1: $p > 0.2$	**B1**	**1.1**	both hypotheses; allow equivalent in words or eg P(1) = 0.2	allow any parameter as long as clearly defined as probability
			p is the probability that the spinner shows a 1 (on any given spin) **oe**	**B1**	**2.5**		
			use of $X \sim B(100,0.2)$ where x is the number of 1s obtained in 100 spins to obtain $P(X \geq k)$ or $P(X \leq k)$	**M1**	**3.3**	$k = 27$, 28 or 29	**M0** for $P(X = k)$ **NB** $P(X = 28) = 0.014\ldots$ $P(X = 27) = 0.020168\ldots$
			$P(X \leq 27) =$ awrt 0.97 or $P(X \geq 28) =$ awrt 0.034	**A1**	**1.1**	or critical region is $X \geq 28$	
			$0.034 < 0.05$ or $0.97 > 0.95$	**M1**	**3.4**	or 28 is in critical region	**FT** *their* probability, dependent on award of first **M1**
			significant or reject H_0 or accept H_1; may be embedded in conclusion in context	**A1**	**1.1**	must have the correct probability or correct critical region for the last two **A** marks	
			there is sufficient evidence to **suggest** (at 5% level) that the probability of a score of 1 is greater than 0.2	**A1**	**2.2b**		do not allow eg conclude / prove / indicate or other assertive statement instead of suggest; **A0** if answer spoiled
				[7]			
13	(a)		Lee is wrong because				if **B0B0**
			he should make the comparison of 0.033 with 0.05	**B1**	**2.2a**		**SC1** for Lee has confused r with p **or** for 0.37154 suggests positive correlation
			he should make the comparison of 0.37154 with 0	**B1**	**2.2b**	allow he should have compared r with the critical value	
				[2]			

Question			Answer	Marks	AOs		Guidance
13	(b)		465467 + 2×204356	M1	2.1	condone use of 201236 instead of 204356; ignore work relating to lower tail	or 521000 + 1.5 × (521000 – 342500)
			awrt 874180 (or 867940 from use of 210236) from scatter diagram the outliers are approximately 920 000, 1 200 000	A1 [2]	2.2b	numerical values must be mentioned	or 788750 in which case accept two **or** three outliers identified extra one is approximately 800 000
13	(c)		the pmcc would (probably) be closer to 0 because the scatter is less well modelled by a straight line	B1	2.2b	if **B0B0** allow **SC1** for r closer to 0 and p-value larger	
			the p-value would increase because a value which is closer to 0 is more likely assuming there is no correlation	B1 [2]	2.2b		
13	(d)		the student's suggestion is reasonable, since there are other regions defined in the LDS	B1 [1]	2.2b		

Question			Answer	Marks	AOs		Guidance
14			$\frac{1}{2} - \sin 2x \cos x = \sin x \cos 2x$	**M1**	**3.1a**		
			$\sin 3x = \frac{1}{2}$ **oe**	**M1**	**2.1**	from compound angle formula allow sign errors only	*or* $4\sin^3 x - 3\sin x + ½ = 0$ **oe**
			$x = \frac{\pi}{18}$ and $x = \frac{5\pi}{18}$	**A1** **A1**	**3.2a** **1.1**	**A1** for each	0.17453… **A1** 0.87266… **A1** to 2 or more sf
			$\pm \int \left(\sin x \cos 2x - \left(\frac{1}{2} - \sin 2x \cos x\right)\right) \mathrm{d}x$ **oe**	**M1**	**1.1**	ignore limits	
			$\mathrm{F}[x] = -\frac{x}{2} - \frac{\cos 3x}{3}$	**A1**	**1.1**	allow the positive of this	$\pm\left(-\frac{4}{3}\cos^3 x + \cos x - \frac{x}{2}\right)$ **oe** or $\pm(-⅓\cos 2x \cos x + ⅓\sin x \sin 2x - ½x)$ **oe** for **A1**
			$\mathrm{F}[\frac{5\pi}{18}] - \mathrm{F}[\frac{\pi}{18}]$	**M1**	**1.1**	F[x] must be one of the correct forms	F[0.87266] – F[0.17453] for **M1**
			$\frac{\sqrt{3}}{3} - \frac{\pi}{9}$ or $\frac{3\sqrt{3}-\pi}{9}$ **cao**	**A1**	**3.2a**		
				[8]			

Question			Answer	Marks	AOs		Guidance
15	(a)		$[\mathrm{h}(x)$ **or** $\mathrm{fg}(x) =]\ \sqrt{x^3 - x - 6}$ **oe** $x > 2$	**B1** **B1** **[2]**	**1.1** **1.1**	expression domain	mark the final answer
15	(b)		$\sqrt{18}$ **oe isw FT** *their* $\mathrm{h}(x)$	**B1** **[1]**	**1.1**	allow 4.2426406872… rounded to 2 or more sf	
15	(c)		$\frac{1}{2}\times\frac{3x^2-1}{\sqrt{(x^3-x-6)}}$ or $\frac{3x^2-1}{2\mathrm{h}(x)}$ **oe** *their* $\frac{dh}{dx}$ evaluated at $x = 3$ $\frac{3\sqrt{2}}{13}$ or 0.326356975932 rounded to 2 sf or better	**M1** **A1** **M1** **A1** **[4]**	**3.1a** **1.1** **1.1** **3.2a**	chain rule used all correct	allow one slip in differentiation, eg sign error $\mathrm{h}(x)$ must be correct for first **M1**
			OR $x^2 = y^3 - y - 6 \Longrightarrow 2x\frac{dx}{dy} = 3y^2 - 1$ **oe** $\frac{dx}{dy} = \frac{3y^2-1}{2x}$ *or* $\frac{dy}{dx} = \frac{2x}{3y^2-1}$ substitution of $y = 3$ **and** $x =$ *their* $\sqrt{18}$ $\frac{3\sqrt{2}}{13}$ or 0.326356975932 rounded to 2 sf or better	**M1** **A1** **M1** **A1** **[4]**			allow one slip eg sign error rearrangement to find $\mathrm{h}^{-1}(x)$ explicitly in terms of x followed by differentiation does not score

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