



AEO “Nazarbayev Intellectual Schools”
Cambridge International Examinations

MATHEMATICS

Grade 12

Paper 1

May 2016

MARK SCHEME

Maximum Mark: 30

18/05/2016 Version 2

This document consists of **5** printed pages and **1** blank page.



Marks awarded

- The number of marks awarded for each part of the question should be recorded in the 'For Examiner's Use' column at the right side of the page using the annotations indicated in the mark scheme e.g. M1 A1
- Half marks cannot be awarded.
- The total number of marks should be added for each page and written on the front of the question paper, added up to give the final total for the paper.
- If a question instructs the candidates to use a particular method then that method must be used.
- In other questions any valid alternative method is acceptable, and candidates should be awarded equivalent marks for reaching a comparable stage in their solution.
- Particular care should be taken when marking questions where the working leads to a given solution – the candidate must provide a full justification of the result.
- If a question requires an exact solution then the candidate must use exact values throughout their working.

Annotations and abbreviations

M Marks are awarded for using a correct method and are not lost for purely numerical errors.

A Marks are awarded for an accurate answer and depend on the preceding M marks. Therefore M0 A1 cannot be awarded.

B Marks are independent of M marks and are awarded for a correct final answer or correct intermediate stage.

Where follow through (**ft**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer, whether or not it was correct.

Question	Answer	Mark	Additional Guidance
1	Obtain both values -1 and 5	B1	
2	Obtain 5	B1	
3	State either $(x-2)(x^2+2x+4)$ or $(x^2+2x+4)(x-2)$	B1	Accepted if attempt to factor till linear complex multipliers
4	State both $y=4x+7$ and $6-x=0$ or equivalents	B1	
5	$1 + (-2) \cdot 5x + \frac{-2(-2-1)}{2!} \cdot (5x)^2 + \dots$ and obtain 75	B1	
6	<u>Either</u> State two linear equations, one with signs of $3x$ and x the same and the other with the signs different Solve to obtain final answers $x=-2$ and $x=-\frac{3}{2}$. <u>Or</u> Square both sides to obtain three terms on each side and simplify to obtain three-term quadratic equation Solve to obtain final answers $x=-2$ and $x=-\frac{3}{2}$	M1 A1 M1 A1 [2]	Other alternative solutions are accepted.
7	Obtain 6	B1	
8	Obtain $8x \ln x + 4x$ or equivalent	M1	
9	Differentiate to obtain $-6\sin 3x$ and substitute to obtain -6	B1	
10	Obtain $18e^{3x}$	B1	
11	Differentiate to obtain first derivative of the form $kx(3x^2+4)^{-\frac{1}{2}}$ for any non-zero constant k Obtain correct $3x(3x^2+4)^{-\frac{1}{2}}$ and substitute to obtain $\frac{3}{2}$ or equivalent	M1 A1 [2]	
12	Obtain $3e^4 - 1$	B1	

13	Obtain $-4x \cos x + 4 \sin x$ (with no penalty for absence of $\dots + c$)	B1	
14	Obtain $2 \sin \theta (1 - \sin^2 \theta)$ or equivalent	B1	
15	Obtain $\frac{5}{7}$	B1	
16	$3\pi + \pi + 0 = k\pi$ or equivalent and obtains answer 4	B1	
17	Obtain 5	B1	
18	Obtain $M(1, 4, -5)$ and hence distance 7	B1	
19	Obtain $b = \frac{5}{2}a^2$	B1	
20	Obtain $3 + 6i$ or $6i + 3$	B1	

21	Sketch circle in fourth quadrant with centre at point (3; -3) and touching each axis	B1	Accepted if the scale is not shown.
22	$\cos^6 \theta + 6i \cos^5 \theta \cdot \sin \theta - 15 \cos^4 \theta \sin^2 \theta -$ $- 20i \cos^3 \theta \sin^3 \theta + 15 \cos^2 \theta \sin^4 \theta + \dots$ and obtain 15	B1	
23	Equate real parts and imaginary parts of $(x + yi)^2 = -6 + 8i$ and eliminate one variable to obtain equation in x or in y Obtain both square roots $\pm(\sqrt{2} + 2\sqrt{2}i)$ or $\pm(\sqrt{2} + \sqrt{8}i)$	M1 A1 [2]	Alternative methods are accepted.
24	Carry out substitution to obtain $\int (\frac{1}{2}u^{\frac{3}{2}} - \frac{3}{2}u^{\frac{1}{2}}) du$ or equivalent in terms of u (allowing mark if du absent) Obtain $\frac{1}{5}(2x+3)^{\frac{5}{2}} - (2x+3)^{\frac{3}{2}}$ (with no penalty for absence of $\dots + c$ but B0 if final answer still in terms of u)	B1 B1 [2]	
25	Attempt use of quotient rule (or equivalent) to obtain form $\frac{\dots - \dots}{(x+2)^2}$ Obtain correct $\frac{2a-1}{(x+2)^2}$ (or equivalent) and conclude $a > \frac{1}{2}$	M1 A1 [2]	

