

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9709	23
1	State or imply $y \log 2.8 = x \log 13$ Rearrange into form $y = \frac{\log 13}{\log 2.8} x$ or equivalent Obtain answer $k = 2.49$		B1 B1 B1 [3]
2	(i) State or imply correct ordinates 0.27067..., 0.20521..., 0.14936... Use correct formula, or equivalent, correctly with $h = 0.5$ and three ordinates Obtain answer 0.21 with no errors seen (ii) Justify statement that the trapezium rule gives an over-estimate		B1 M1 A1 [3] B1 [1]
3	EITHER State or imply non-modular inequality $(2x - 1)^2 < (x + 4)^2$, or corresponding equation or pair of linear equations Make reasonable solution attempt at a 3-term quadratic, or solve two linear equations Obtain critical values -1 and 5 State correct answer $-1 < x < 5$ OR Obtain one critical value, e.g. $x = 5$, by solving a linear equation (or inequality) or from a graphical method or by inspection Obtain the other critical value similarly State correct answer $-1 < x < 5$		M1 M1 A1 A1 [4] B1 B2 B1
4	(a) Obtain integral $a \sin 2x$ with $a = \pm \left(1, 2 \text{ or } \frac{1}{2}\right)$ Use limits and obtain $\frac{1}{2}$ (AG) (b) Use $\tan^2 x = \sec^2 x - 1$ and attempt to integrate both terms Obtain $3 \tan x - 3x$ Attempt to substitute limits, using exact values Obtain answer $2\sqrt{3} - \frac{\pi}{2}$		M1 A1 [2] M1 A1 M1 A1 [4]
5	(i) Use product rule Obtain correct derivative in any form Show that derivative is equal to zero when $x = 3$ (ii) Substitute $x = 1$ into gradient function, obtaining $2e^{-1}$ or equivalent State or imply required y -coordinate is e^{-1} Form equation of line through $(1, e^{-1})$ with gradient found (NOT the normal) Obtain equation in any correct form		M1 A1 A1 [3] M1 B1 M1 A1 [4]
6	(i) Make a recognisable sketch of a relevant graph, e.g. $y = \ln x$ or $y = 2 - x^2$ Sketch a second relevant graph and justify the given statement (ii) Consider sign of $\ln x - (2 - x^2)$ at $x = 1.3$ and $x = 1.4$, or equivalent Complete the argument correctly with appropriate calculations		B1 B1 [2] M1 A1 [2]

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
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- (iii) Show that given equation is equivalent to $x = \sqrt{(2 - \ln x)}$ or *vice versa* B1 [1]
- (iv) Use the iterative formula correctly at least once M1
 Obtain final answer 1.31 A1
 Show sufficient iterations to justify its accuracy to 2 d.p. or show there is a sign change in the interval (1.305, 1.315) B1 [3]
- 7 (i) Substitute $x = 3$ and equate to 30 M1
 Substitute $x = -1$ and equate to 18 M1
 Obtain a correct equation in any form A1
 Solve a relevant pair of equations for a or for b M1
 Obtain $a = 1$ and $b = -13$ A1 [5]
- (ii) Either show that $f(2) = 0$ or divide by $(x - 2)$, obtaining a remainder of zero B1
 Obtain quadratic factor $2x^2 + 5x - 3$ B1
 Obtain linear factor $2x - 1$ B1
 Obtain linear factor $x + 3$ B1
 [Condone omission of repetition that $x - 2$ is a factor.]
 [If linear factors $2x - 1, x + 3$ obtained by remainder theorem or inspection, award B2 + B1.] [4]
- 8 (i) Use correct $\sin(A - B)$ and $\cos(A - B)$ formulae M1
 Substitute exact values for $\sin 30^\circ$ etc. M1
 Obtain given answer correctly A1 [3]
- (ii) State $\sqrt{3} \sin x = \frac{1}{2} \sec x$ B1
 Rearrange to $\sin 2x = k$, where k is a non-zero constant M1
 Carry out evaluation of $\frac{1}{2} \sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$ M1
 Obtain answer 17.6° A1
 Carry out correct method for second answer M1
 Obtain remaining 3 answers from $17.6^\circ, 72.4^\circ, 197.6^\circ, 252.4^\circ$ and no others in the range A1 [6]
 [Ignore answers outside the given range]