

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2012	9709	23

- 1 Either: Obtain value $x^3 = 27$ from inspection, equation, ... B1
 Obtain value $x^3 = 1$ similarly B2
 Obtain $x = 1$ and $x = 3$ B1
Or: Attempt to square both sides obtaining 3 terms on LHS M1
 Attempt solution for x^3 of 3-term quadratic DM1
 Obtain $x^3 = 1$ and $x^3 = 27$ A1
 Obtain $x = 1$ and $x = 3$ A1 [4]
- 2 State or imply that $\ln y = \ln A + x \ln b$ B1
 Equate intercept on y -axis to $\ln A$ M1
 Obtain $\ln A = 2.14$ and hence $A = 8.5$ A1
 Attempt gradient of line or equivalent (or use of correct substitution) M1
 Obtain $0.47 = \ln b$ or equivalent and hence $b = 1.6$ A1 [5]
- 3 (i) Substitute 2 and equate to zero or divide and equate remainder to zero M1
 Obtain $a = 2$ A1 [2]
- (ii) (a) Attempt to find quadratic factor by division, inspection or identity M1
 Obtain $2x^2 + x - 3$ A1
 Conclude $(x - 2)(2x + 3)(x - 1)$ A1 [3]
- (b) Attempt substitution of -1 or attempt complete division by $x + 1$ M1
 Obtain 6 A1 [2]
- 4 (i) Use $\sec^2 \theta = 1 + \tan^2 \theta$ B1
 Attempt solution of quadratic equation in $\tan \theta$ M1
 Obtain $\tan^2 \theta - 12 \tan \theta + 36 = 0$ or equivalent and hence $\tan \theta = 6$ A1 [3]
- (ii) (a) Attempt use of $\tan(A - B)$ formula M1
 Obtain $\frac{5}{7}$ following their value of $\tan \theta$ A1√ [2]
- (b) Attempt use of $\tan 2\theta$ formula M1
 Obtain $-\frac{12}{35}$ A1 [2]
- 5 (i) Differentiate to obtain expression of form $ke^{\frac{1}{2}x} + m$ M1
 Obtain correct $2e^{\frac{1}{2}x} - 6$ A1
 Equate attempt at first derivative to zero and attempt solution DM1
 Obtain $\frac{1}{2}x = \ln 3$ or equivalent A1
 Conclude $x = \ln 9$ or $a = 9$ A1 [5]
- (ii) Integrate to obtain expression of form $ae^{\frac{1}{2}x} + bx^2 + cx$ M1
 Obtain correct $8e^{\frac{1}{2}x} - 3x^2 + 3x$ A1
 Substitute correct limits and attempt simplification DM1
 Obtain $8e - 14$ A1 [4]

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2012	9709	23

- 6 (i) Obtain derivative of form $k(2t + 1)^{-3}$ M1
 Obtain $-4(2t + 1)^{-3}$ or equivalent as derivative of x A1
 Obtain $\frac{1}{2}(t + 2)^{-\frac{1}{2}}$ or equivalent as derivative of y B1
 Equate attempt at $\frac{dy}{dx}$ to -1 M1
 Obtain $(2p + 1)^3 = 8(p + 2)^{\frac{1}{2}}$ or equivalent A1
 Confirm given answer $p = (p + 2)^{\frac{1}{6}} - \frac{1}{2}$ A1 [6]
- (ii) Use iteration process correctly at least once M1
 Obtain final answer 0.678 A1
 Show sufficient iterations to 5 decimal places to justify answer or show a sign change in the interval (0.6775, 0.6785) A1 [3]
 [0.7 \rightarrow 0.68003 \rightarrow 0.67857 \rightarrow 0.67847 \rightarrow 0.67846]
- 7 (i) Expand to obtain $4 \sin^2 x + 4 \sin x \cos x + \cos^2 x$ B1
 Use $2 \sin x \cos x = \sin 2x$ B1
 Attempt to express $\sin^2 x$ or $\cos^2 x$ (or both) in terms of $\cos 2x$ M1
 Obtain correct $\frac{1}{2}k(1 - \cos 2x)$ for their $k \sin^2 x$ or equivalent A1√
 Confirm given answer $\frac{5}{2} + 2 \sin 2x - \frac{3}{2} \cos 2x$ A1 [5]
- (ii) Integrate to obtain form $px + q \cos 2x + r \sin 2x$ M1
 Obtain $\frac{5}{2}x - \cos 2x - \frac{3}{4} \sin 2x$ A1
 Substitute limits in integral of form $px + q \cos 2x + r \sin 2x$ and attempt simplification DM1
 Obtain $\frac{5}{8}\pi + \frac{1}{4}$ or exact equivalent A1 [4]