Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – October/November 2011	9709	21

1 **EITHER** State or imply non-modular inequality $(4 - 5x)^2 < 3^2$, or corresponding equation or pair of linear equations M1

Obtain critical values $\frac{1}{5}$ and $\frac{7}{5}$ A1

State correct answer $\frac{1}{5} < x < \frac{7}{5}$ A1

OR State one critical value, e.g. $x = \frac{1}{5}$, by solving a linear equation (or inequality) or from a graphical method or by inspection B1

State the other critical value correctly B1

State correct answer $\frac{1}{5} < x < \frac{7}{5}$ B1 [3]

2 Integrate and obtain term of the form $k\ln(4x + 1)$ M1

State correct term $\frac{1}{2}\ln(4x+1)$ A1

Substitute limits correctly M1

Use law for the logarithm of a quotient or a power M1

Obtain given answer correctly A1 [5]

3 Obtain derivative of the form $k \sec^2 2x$, where $k = 1$ or $k = \frac{1}{2}$ M1

Obtain correct derivative $\sec^2 2x$ A1

Use correct method for solving $\sec^2 2x = 4$ M1

Obtain answer $x = \frac{1}{6}\pi$ (or 0.524 radians) A1

Obtain answer $x = \frac{1}{3}\pi$ (or 1.05 radians) and no others in range A1 [5]

4 Carry out recognizable solution method for quadratic in 3^x M1

Obtain $3^x = 5$ and $3^x = 2$ A1

Use logarithmic method to solve an equation of the form $3^x = k$, where $k > 0$ M1

State answer 1.46 A1

State answer 0.631 A1 [5]

5 **(i)** Substitute $x = \frac{1}{2}$ and equate to 10 M1

Obtain answer $a = -16$ A1

Either show that f(3) = 0 or divide by $(x - 3)$ obtaining a remainder of zero B1 [3]

(ii) At any stage state that $x = 3$ is a solution B1

Attempt division by $(x - 3)$ reaching a partial quotient of $4x^2 + kx$ M1

Obtain quadratic factor $4x^2 - 4x - 3$ A1

Obtain solutions $x = \frac{3}{2}$ and $x = -\frac{1}{2}$ A1

S.C. M1A1√ if value of 'a' incorrect [4]

6 **(i)** Consider sign of $x^3 - 2x^2 + 5x - 3$ at $x = 0.7$ and $x = 0.8$ M1
Complete the argument correctly with appropriate calculations A1 [2]

(ii) Rearrange equation to given equation or *vice versa* B1
State $a = 2$ and $b = 5$ B1 [2]

(iii) Use the iterative formula correctly at least once M1
Obtain final answer 0.74 A1
Show sufficient iterations to justify its accuracy to 2 d.p. or show there is a sign change in the interval (0.735, 0.745) B1 [3]

7 **(i)** Use product rule to differentiate y M1
Obtain correct derivative in any form in t for y A1
Use $\frac{dy}{dx} = \frac{dy}{dt} \div \frac{dx}{dt}$ M1
Obtain given answer correctly A1 [4]

(ii) State $t = 0$ M1
State that $\frac{dy}{dx} = 0$ and make correct conclusion A1 [2]

(iii) Substitute $t = -2$ into equation for x or y M1
Obtain $(e^{-6}, 4e^{-2} + 3)$ A1 [2]

8 **(i)** Make relevant use of the $\cos(A + B)$ formula M1*
Make relevant use of the $\cos 2A$ and $\sin 2A$ formulae M1*
Obtain a correct expression in terms of $\cos x$ and $\sin x$ A1
Use $\sin^2 x = 1 - \cos^2 x$ to obtain an expression in terms of $\cos x$ M1(dep*)
Obtain given answer correctly A1 [5]

(ii) Replace integrand by $\frac{1}{2}\cos 3x + \frac{1}{2}\cos x$, or equivalent B1
Integrate, obtaining $\frac{1}{6}\sin 3x + \frac{1}{2}\sin x$, or equivalent B1 + B1√
Use limits correctly M1
Obtain given answer A1 [5]