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	GCE AS LEVEL – October/November 2012	9709	22

1 **EITHER** State or imply non-modular inequality $(2x+1)^2 < (2x-5)^2$, or corresponding equation or pair of linear equations — M1
Obtain critical value 1 — A1
State correct answer $x < 1$ — A1

OR State the critical value $x = 1$, by solving a linear equation (or inequality) or from a graphical method or by inspection — B2
State correct answer $x < 1$ — B1 [3]

2 Use quotient rule or product rule, correctly — M1
Obtain correct derivative in any form — A1
Equate derivative to zero and solve for x — M1
Obtain $x = \frac{\pi}{8}$ — A1 [4]

3 **(i)** Attempt division by $x^2 - 3x + 2$ or equivalent, and reach a partial quotient of $x^2 + kx$ — M1
Obtain partial quotient $x^2 - x$ — A1
Obtain $x^2 - x - 2$ with no errors seen — A1 [3]

(ii) Correct solution method for either quadratic e.g. factorisation — M1
One correct solution from solving quadratic or inspection — B1
All solutions $x = 2$, $x = 1$ and $x = -1$ given and no others — A1 [3]

4 **(i)** State or imply correct ordinates 1.4142…, 1.1370…, 1 — B1
Use correct formula, or equivalent, correctly with $h = \frac{\pi}{4}$ and three ordinates — M1
Obtain answer 1.84 with no errors seen — A1 [3]

(ii) Use the iterative formula correctly at least once — M1
Obtain final answer 1.06 — A1
Show sufficient iterations to justify its accuracy to 2 d.p. or show there is a sign change in the interval (1.055, 1.065) — B1 [3]

5 State or imply $\ln y = \ln A - x \ln b$ — B1
Form a numerical expression for the gradient of the line — M1
Obtain $b = 1.82$ — A1
Use gradient and one point correctly to find $\ln A$ — M1
Obtain $\ln A = 3.5$ — A1
Obtain $A = 33.12$ — A1 [6]

6 **(a)** Obtain integral $ke^{-\frac{1}{2}x}$ with any non-zero k M1
Correct integral A1 [2]

(b) State indefinite integral of the form $k \ln (3x - 1)$, where $k = 2$, 6 or 3 M1
State correct integral $2 \ln (3x - 1)$ A1
Substitute limits correctly (must be a function involving a logarithm) M1
Use law for the logarithm of a power or a quotient M1
Obtain given answer correctly A1 [5]

7 **(i)** State $4y\frac{\mathrm{d}y}{\mathrm{d}x}$ as derivative of $2y^2$, or equivalent B1

State $4y + 4x\frac{\mathrm{d}y}{\mathrm{d}x}$ as derivative of $4xy$, or equivalent B1

Equate derivative of LHS to zero and solve for $\frac{\mathrm{d}y}{\mathrm{d}x}$ M1

Obtain given answer correctly A1 [4]

(ii) State or imply that the coordinates satisfy $3x - 2y = 0$ B1
Obtain an equation in x^2 (or y^2) M1
Solve and obtain $x^2 = 4$ (or $y^2 = 9$) A1
State answer (2 , 3) A1
State answer (−2, −3) A1 [5]

8 **(a)** Use tan $(A + B)$ formula to obtain an equation in tan B M1

State equation $\frac{t + \tan B}{1 - t \tan B} = 4$, or equivalent A1

Solve to obtain $\tan B = \frac{4 - t}{1 + 4t}$ A1 [3]

(b) State equation $2\left(\frac{\tan 45 - \tan x}{1 + \tan 45 \tan x}\right) = 3 \tan x$, or equivalent B1

Transform to a quadratic equation M1
Obtain $3\tan^2 x + 5\tan x - 2 = 0$ (or equivalent) A1
Solve the quadratic and calculate one angle, or establish that $\tan x = ⅓, -2$ M1
Obtain one answer, e.g. $x = 18.4^\circ$ A1
Obtain other 3 answers 116.6°, 198.4°, 296.6° and no others in range A1 [6]