

**Mark Scheme 4723
June 2006**

1	Differentiate to obtain $k(4x+1)^{-\frac{1}{2}}$ Obtain $2(4x+1)^{-\frac{1}{2}}$ Obtain $\frac{2}{3}$ for value of first derivative Attempt equation of tangent through (2, 3) Obtain $y = \frac{2}{3}x + \frac{5}{3}$ or $2x - 3y + 5 = 0$	M1 any non-zero constant k A1 or equiv, perhaps unsimplified A1 or unsimplified equiv M1 using numerical value of first derivative provided derivative is of form $k'(4x+1)^n$ A1 5 or equiv involving 3 terms
<hr/>		
2	<u>Either:</u> Attempt to square both sides Obtain $3x^2 - 14x + 8 = 0$ Obtain correct values $\frac{2}{3}$ and 4 Attempt valid method for solving inequality Obtain $\frac{2}{3} < x < 4$ <u>Or:</u> Attempt solution of two linear equations or inequalities Obtain value $\frac{2}{3}$ Obtain value 4 Attempt valid method for solving inequality Obtain $\frac{2}{3} < x < 4$	M1 producing 3 terms on each side A1 or inequality involving $<$ or $>$ A1 M1 implied by correct answer or plausible incorrect answer A1 5 or correctly expressed equiv; allow \leq signs M1 one eqn with signs of $2x$ and x the same, second eqn with signs different A1 B1 M1 implied by correct answer or plausible incorrect answer A1 (5) or correctly expressed equiv; allow \leq signs
<hr/>		
3 (i)	Attempt evaluation of cubic expression at 2 and 3 Obtain -11 and 31 Conclude by noting change of sign	M1 A1 A1 $\sqrt{3}$ or equiv; following any calculated values provided negative then positive
(ii)	Obtain correct first iterate Attempt correct process to obtain at least 3 iterates Obtain 2.34	B1 using x_1 value such that $2 \leq x_1 \leq 3$ M1 using any starting value now A1 3 answer required to 2 d.p. exactly; 2→2.3811→2.3354→2.3410; 2.5→2.3208→2.3428→2.3401; 3→2.2572→2.3505→2.3392

4 (i) State $\ln y = (x-1)\ln 5$	B1 whether following $\ln y = \ln 5^{x-1}$ or not; brackets needed
Obtain $x = 1 + \frac{\ln y}{\ln 5}$	B1 2 AG ; correct working needed; missing brackets maybe now implied
(ii) Differentiate to obtain single term of form $\frac{k}{y}$	M1 any constant k
Obtain $\frac{1}{y \ln 5}$	A1 2 or equiv involving y
(iii) Substitute for y and attempt reciprocal	M1 or equiv method for finding derivative without using part (ii)
Obtain $25 \ln 5$	A1 2 or exact equiv
<hr/>	
5 (i) State $\sin 2\theta = 2 \sin \theta \cos \theta$	B1 1 or equiv; any letter acceptable here (and in parts (ii) and (iii))
(ii) Attempt to find exact value of $\cos \alpha$	M1 using identity attempt or right-angled triangle
Obtain $\frac{1}{4}\sqrt{15}$	A1 or exact equiv
Substitute to confirm $\frac{1}{8}\sqrt{15}$	A1 3 AG
(iii) State or imply $\sec \beta = \frac{1}{\cos \beta}$	B1
Use identity to produce equation involving $\sin \beta$	M1
Obtain $\sin \beta = 0.3$ and hence 17.5	A1 3 and no other values between 0 and 90; allow 17.4 or value rounding to 17.4 or 17.5
<hr/>	
6 (i) <u>Either</u> : Obtain $f(-3) = -7$	B1 maybe implied
Show correct process for compn of functions	M1
Obtain -47	A1 3
<u>Or</u> : Show correct process for compn of functions	M1 using algebraic approach
Obtain $2 - (2 - x^2)^2$	A1 or equiv
Obtain -47	A1 (3)
(ii) Attempt correct process for finding inverse	M1 as far as $x = \dots$ or equiv
Obtain either one of $x = \pm \sqrt{2-y}$ or both	A1 or equiv perhaps involving x
Obtain correct $-\sqrt{2-x}$	A1 3 or equiv; in terms of x now
(iii) Draw graph showing attempt at reflection in $y = x$	M1
Draw (more or less) correct graph	A1 with end-point on x -axis and no minimum point in third quadrant
Indicate coordinates 2 and $-\sqrt{2}$	A1 3 accept -1.4 in place of $-\sqrt{2}$
7 (a) Obtain integral of form $k(4x-1)^{-1}$	M1 any non-zero constant k

Obtain $-\frac{1}{2}(4x-1)^{-1}$	A1	or equiv; allow + c
Substitute limits and attempt evaluation	M1	for any expression of form $k'(4x-1)^n$
Obtain $\frac{2}{21}$	A1 4	or exact equiv
(b) Integrate to obtain $\ln x$	B1	
Substitute limits to obtain $\ln 2a - \ln a$	B1	
Subtract integral attempt from attempt at area of appropriate rectangle	M1	or equiv
Obtain $1 - (\ln 2a - \ln a)$	A1	or equiv
Show at least one relevant logarithm property	M1	at any stage of solution
Obtain $1 - \ln 2$ and hence $\ln(\frac{1}{2}e)$	A1 6 AG	full detail required
<hr/>		
8 (i) State $R = 13$	B1	or equiv
State at least one equation of form $R \cos \alpha = k$, $R \sin \alpha = k'$, $\tan \alpha = k''$	M1	or equiv; allow sin / cos muddles; implied by correct α
Obtain 67.4	A1 3	allow 67 or greater accuracy
(ii) Refer to translation and stretch	M1	in either order; allow here equiv terms such as 'move', 'shift'; with both transformations involving constants
State translation in positive x direction by 67.4	A1√	or equiv; following their α ; using correct terminology now
State stretch in y direction by factor 13	A1√ 3	or equiv; following their R ; using correct terminology now
(iii) Attempt value of $\cos^{-1}(2 \div R)$	M1	
Obtain 81.15	A1√	following their R ; accept 81
Obtain 148.5 as one solution	A1	accept 148.5 or 148.6 or value rounding to either of these
Add their α value to second value correctly attempted	M1	
Obtain 346.2	A1 5	accept 346.2 or 346.3 or value rounding to either of these; and no other solutions

9 (i) Attempt to express x in terms of y	*M1 obtaining two terms
Obtain $x = e^{\frac{1}{2}y} + 1$	A1 or equiv
State or imply volume involves $\int \pi x^2$	B1
Attempt to express x^2 in terms of y	*M1 dep *M ; expanding to produce at least 3 terms
Obtain $k \int (e^y + 2e^{\frac{1}{2}y} + 1) dy$	A1 any constant k including 1; allow if dy absent
Integrate to obtain $k(e^y + 4e^{\frac{1}{2}y} + y)$	A1
Use limits 0 and p	M1 dep *M *M ; evidence of use of 0 needed
Obtain $\pi(e^p + 4e^{\frac{1}{2}p} + p - 5)$	A1 8 AG ; necessary detail required
(ii) State or imply $\frac{dp}{dt} = 0.2$	B1 maybe implied by use of 0.2 in product
Obtain $\pi(e^p + 2e^{\frac{1}{2}p} + 1)$ as derivative of V	B1
Attempt multiplication of values or expressions	M1
for $\frac{dp}{dt}$ and $\frac{dV}{dp}$	A1 following their $\frac{dV}{dp}$ expression
Obtain $0.2\pi(e^4 + 2e^2 + 1)$	A1 5 or greater accuracy
Obtain 44	

