1. a) MIDPOINT $(-3,1)$ B1 B1

ATTEMPTS TO FIND $|BC|$, $|AC|$ OR $|AB|$ M1

GIVES $r=5$ A1

b) "$(x+3)^2+(y-1)^2=25$" B1

SUBS $x=0$ M1

SOLVES & SIMPLIFIES QUADRATIC M1

$a=<\begin{matrix}5\\-3\end{matrix}$ BOTH A1

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2. $f'(x)=1-25x^{-2}$ B1 B1 (ONE MARK FOR ATTEMPTING DIFFERENTIATION)

$f''(x)=\frac{50}{x^3}$ B1

"$1-25x^{-2}$"$=0$ M1 ft

SOLVES EQUATION M1

$x=\pm 5$ A1

GIVES FULL CO-ORDS AS $(5,20)$ $(-5,0)$ A1

SUBS INTO $\frac{50}{x^3}$ M1

CONCLUDES $(5,20)$ IS MIN & $(-5,0)$ IS MAX A1

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3. a) $ar^2=4$ OR $ar^5=6.912$ B1

SOLVES BY DIVISION OR SUBSTITUTION M1

$r=1.2=\frac{6}{5}$ A1 c.a.o

$a=\frac{25}{9}$ A1 c.a.o

b) "$\frac{\frac{25}{9}(1.2^{10}-1)}{1.2-1}$" OR SIMILAR M1

72.1... A1

4. $\int x^3 - 4x \, dx$ B1

$\int_0^2$ B1

$\int_2^{\sqrt{8}}$ B1

$\frac{1}{4}x^4 - 2x^2$ M1

$(4-8)-(0)$ OR $(16-16)-(4-8)$ M1

OBTAINS -4 & 4 A1 (both) ← dep

STATES OR IMPLIES BOTH AREAS ARE 4 E1

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5. $2r + r\theta = 33$ B1 B1 (CAO MARK FOR $r\theta$)

$\frac{1}{2}r^2\theta = 67.5$ B1

ATTEMPT SOLUTION BY SUBSTITUTION M1

$2r^2 - 33r + 135$ OR $15\theta^2 - 61\theta + 60$ A1

$(2r-15)(r-9)$ $(3\theta-5)(5\theta-12)$

OR ATTEMPT IN QUADRATIC FORMULA M1

GIVES CORRECT PAIRINGS

$r=9$ WITH $\theta = \frac{5}{3}$

$r = \frac{15}{2}$ WITH $\theta = \frac{12}{5}$ A3 −1 eeoo

6. a) USES GAP $\frac{\pi}{12}$ B1

ATTEMPTS CORRECT EVALUATIONS OF $\cos^2 x$ FOR THEIR x VALUES (AT LEAST 2 NON ZERO VALUES) B1

USES $\frac{\text{THICKNESS}}{2}\left[\text{FIRST} + \text{LAST} + 2 \times \text{REST}\right]$ M1

$\frac{\pi/12}{2}\left[1 + \frac{1}{4} + 2\left(\frac{2+\sqrt{3}}{4} + \frac{3}{4} + \frac{1}{2}\right)\right]$ M1

0.735 A1

b) USE OF $1 - \cos^2 2x$ B1

SPLITS INTO $\int_0^{\frac{\pi}{3}} 1 \, dx$ & $\int_0^{\frac{\pi}{3}} \cos 2x \, dx$ M1

GIVES $\frac{\pi}{3}$ M1

A.W.R.T 0.312 A1

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7. $\pi - (1.1 + 0.7)$ OR 1.3416^c B1

USES SINE RULE TO FIND AC OR BC M1

$|BC| = 56.229...$ OR $|AC| = 77.787...$ A1

USES TRIGONOMETRY ON RIGHT ANGLE TRIANGLE CORRECTLY M1 dep

SHOWS $50.1112...$ A1

8. a) SUBSTITUTES $x=1$ INTO $f(x)$ M1

SHOWS 0 AND CONCLUDES A1

b) $(x-1)(x^2+ax+b)$ M1

$(x-1)(x^2-3)$ M1

$(x-1)(x-\sqrt{3})(x+\sqrt{3})$ A1

c) SHOWS $\tan\theta = 1$ OR $\sqrt{3}$ OR $-\sqrt{3}$ M1

SIGHT OF 45 OR 60 OR -60 M1

$45^\circ, 60^\circ, 120^\circ, 225^\circ, 240^\circ, 300^\circ$ A4 -1 eeoo

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9. $x = y^5$ B1

$\log_2\left(\frac{x}{y}\right)$ B1

$\log_2 4$ B1

$\frac{x}{y} = 4$ B1

$y^5 = 4y$ OR $x^5 = 1024x$ M1

$y^2 = 2$ OR $x^2 = 32$ A1

$y = \sqrt{2}$ A1 cao

$x = 4\sqrt{2}$ A1 c.a.o

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10. SIGHT OF $\binom{13}{7}$ OR $\binom{13}{6}$ OR IN THE 2ND PART $\binom{1}{7}\binom{14}{6}$ OR $\binom{14}{8}$ M1

a) 1716 A1

b) 3003 A1