1. SIGHT OF $\frac{5\pi}{6}$ B1

(USE OF STANDARD TRIGONOMETRY ON $\hat{OBC}$, OR SINE RULE) M1

($|OC| = \frac{6}{5}\sqrt{3}$ O.E
$|BC| = \frac{6}{5}$ O.E) A1

AREA OF $\hat{OBC}$ AS $\frac{1}{2} \times \frac{6}{5}\sqrt{3} \times \frac{6}{5}$ OR $\frac{1}{2} \times \frac{6}{5}\sqrt{3} \times \sin\frac{\pi}{6}$ M1

AREA OF SECTOR $= \frac{1}{2} \times 2.4^2 \times \frac{5\pi}{6}$ M1

(AREA OF $\hat{OBC} = \frac{18}{25}\sqrt{3}$ OR 1.247....
OR
AREA OF SECTOR $= \frac{12\pi}{5}$ OR 7.5398...) A1

A.W.R.T 8.79 C.A.O A1

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2. $(y =) \frac{1}{4}x + x^{-1}$ O.E B1

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

"$\frac{1}{4} - x^2$" > 0 M1

$x^2 > 4$ A1

M1 SIGHT OF BOTH -2 & 2
M1 DIAGRAM OR EQUIVALENT

$x < -2$ OR $x > 2$ A1 dep

DO NOT ACCEPT $\leq$ $\geq$
DO NOT ACCEPT $2 < x < -2$
ACCEPT "AND" INSTEAD OF "OR"

3. $a + ar = 240$ OR $\frac{a(r^2-1)}{r-1} = 240$ M1

$a + ar^2 = 200$ M1

SUBSTITUTION OR DIVISION OF EQUATIONS M1

$6r^2 - 5r + 1$ A1

$(3r-1)(2r-1)$ M1

$r = \frac{1}{2}$ / $\frac{1}{3}$ BOTH A1

$a = 160$ / 180 BOTH A1 ft

$\frac{"160"}{1-"\frac{1}{2}"}$ OR $\frac{"180"}{1-"\frac{1}{3}"}$ M1

320 & 270 (BOTH) A1

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4. $8\left(\frac{\sin x}{\cos x}\right)^2 \sin x = \cos x$ OR $\frac{8\sin^2 x}{\cos^3 x}\sin x = \cos x$ M1

$8\sin^3 x = \cos^3 x$ M1

$8\tan^3 x = 1$ OR $\tan^3 x = \frac{1}{8}$ M1

$\tan x = \frac{1}{2}$ A1

A.W.R.T 0.46^c & 3.61^c c.a.o A1 A1

ALTERNATIVE FOR THE FIRST 3 MARKS

M1 DIVIDES EQUATION BY $\cos x$ TO GET $\frac{8\tan^3 x \sin x}{\cos x} = 1$

M1 USES $\frac{\sin x}{\cos x} = \tan x$

M1 THEN SIMPLIFIES $8\tan^3 x = 1$

5. a) $3^3 - 2\times3^2 - 3 - 6$ M1

OBTAINS ZERO & CONCLUDES A1

b) $(x-3)(x^2+Ax+B)$ M1

$(x-3)(x^2+x+2)$ A1

c) $\left(\frac{dy}{dx}\right) = 12x^3 - 24x^2 - 72x + 240$ M1

$"12x^3 - 24x^2 - 72x + 240" = 0$ M1

$x^3 - 2x^2 - x - 6 = 0$ A1

ATTEMPTS DISCRIMINANT ON x^2+x+2 M1

OBTAINS NEGATIVE (−7) & STATES ONLY SOLUTION OR STATIONARY POINT IS AT $x=3$ A1

OBTAIN y CO-ORD OF -3 A1

$\frac{d^2y}{dx^2} = 36x^2 - 48x - 12$ M1

USES $\frac{d^2y}{dx^2}$ CORRECTLY OBTAINS POSITIVE (168) & STATES MINIMUM A1

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6. $\left[\binom{13}{5}\left(\frac{9}{2x}\right)^5\left(-\frac{2x^2}{3}\right)^8\right]$ M1 M1

OR $\binom{13}{8}$

92664 cao A1

7.

$19000 = A \times 10^{3k}$ OR $38000 = A \times 10^{6k}$ M1

SUBSTITUTES OR DIVIDES M1

$10^{3k} = 2$ O.E A1

USES LOGS CORRECTLY M1

$k = \frac{1}{3}\log 2$ A.W.R.T 0.10 A1

$A = 9500$ A1

8.

IMPLIES THAT CENTRE OF C_3 LIES ON $x = 12$ M1

(SIGHT OF "$6+r$" OR "$6-r$" OR TRIANGLE DRAWN WITH VERTICES AT CENTRE OF C_1, CENTRE OF C_3 & INTERSECTION OF C_1 & C_2) M1

"$6^2 + (6-r)^2 = (6+r)^2$" I.E USE OF PYTHAGORAS M1

EXPANDS & SIMPLIFIES CORRECTLY M1

"r" $= 1.5$ O.E A1

$(x-12)^2 + \left(y - \frac{3}{2}\right)^2 = $ "$\frac{9}{4}$" O.E A1 A1

9.

IMPLIES OR STATES $A(0,6)$ B1

$\left((2x-1)(x-6) \right.$

$\left. B\left(\frac{1}{2},0\right) \quad C(6,0) \text{ (OR IMPLIED)} \right)$ B1

OR

$D\left(\frac{13}{2},16\right)$ (OR IMPLIED) B1

$\left(\int_0^{\frac{1}{2}} 2x^2 - 13x + 6 \, dx \right.$

$\left. \int_6^{\frac{13}{2}} 2x^2 - 13x + 6 \, dx \right)$ M1

OR M1 LIMITS BOTH

$\frac{2}{3}x^3 - \frac{13}{2}x^2 + 6x$ M1

$\left(\left[\frac{1}{12} - \frac{13}{8} + 3\right] - [0] \right.$

$\left. \left[\frac{2197}{12} - \frac{2197}{8} + 39\right] - [144 - 234 + 36] \right)$ M1

OR

$\frac{35}{24}$ A1

SIGHT OF 39 & 18 (BOTH) M1

FINAL ANSWER $\frac{469}{24}$ A1

10. a) SPACING OF 0.4 USED B1

$$\begin{pmatrix} \frac{a}{2} & \frac{5}{12}a & \frac{5}{14}a & \frac{5}{16}a & \frac{5}{18}a & \frac{a}{4} \\ \text{OR} & & & & & \\ \frac{a}{2} & \frac{a}{2.4} & \frac{a}{2.8} & \frac{a}{3.2} & \frac{a}{3.6} & \frac{a}{4} \end{pmatrix} \quad \text{M1}$$

"$\frac{\text{THICKNESS}}{2}$ [FIRST + LAST + 2 × (SUM OF THE REST)]" M1

$\frac{1753}{2520}a = 701.2$ OR $0.6956..a = 701.2$ M1

$a = 1008$ c.a.o A1

b) IMPLIES OR STATES "AREA STRETCHES VERTICALLY" BY SCALE FACTOR OF 5 B1

IMPLIES OR STATES "AREA STRETCHES HORIZONTALLY" BY SCALE FACTOR $\frac{1}{2}$ B1

STATES 1753 A1

(THIS MARK CAN ONLY BE ACHIEVED IF AT LEAST ONE OF THE PREVIOUS B1 MARKS OF PART (b) HAS BEEN AWARDED)