1. a) $(x+1)(x^2-6x+8)$ OR $(x-4)(x^2-x-2)$ M1

OR $(x-2)(x^2-3x-4)$

x^3-5x^2+2x+8 A1

b) $\int_{2}^{4} x^3-5x^2+2x+8 \, dx$ A1

$\left(64-\frac{320}{3}+16+32\right)-\left(4-\frac{40}{3}+4+16\right)$ OR $\frac{16}{3}-\frac{32}{3}$ M1

OBTAINS $-\frac{16}{3}$ O.E   A1

STATES OR INDICATES AREA $=\frac{16}{3}$ A1   ft & dep

2. $8a-4-10+b=36$ OR $8a+b=50$ O.E   M1

$-8a-4+10+b=40$ OR $-8a+b=34$ O.E   M1

SOLVES BY ANY METHOD   M1

$a=1$ A1 c.a.o

$b=42$ A1 c.a.o

3. a) $(\boxed{10},\boxed{-4})$ B1 B1

$r=10$ B1

b) $\frac{4+4}{4-10}$ O.E   M1

$-\frac{4}{3}$ A1

c) USES GRADIENT $\frac{3}{4}$ B1

$y-4=\frac{3}{4}(x-4)$ O.E

e.g $y=\frac{3}{4}x+1$ OR $4y=3x+4$ A1

4. $1 + \boxed{6kx} + \boxed{15k^2x^2} + \boxed{20k^3x^3}$ **B3**

$$20k^3 = 2 \times 15k^2 \quad \text{o.e} \quad \textbf{M1}$$

$$k = \frac{3}{2} \quad \textbf{A1}$$

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5. a) USES GAP OF 2 **B1**

0.7071 0.5 0.4082 0.3536 0.3162

$\boxed{\text{SHOWS 5 VALUES}}$, SENSIBLE ACCURACY , ALLOW 1 ERROR **M1**
M1

CORRECT STRUCTURE $\frac{\text{"THICKNESS"}}{2} \left[\text{"FIRST"} + \text{"LAST"} + 2 \text{ SUM OF THE REST} \right]$ **M1**

GIVES 3.55 c.a.o **A1**

b) MORE STRIPS **OR** MORE TRAPEZIA **E1**

c) OVER-ESTIMATE WITH CORRECT EXPLANATION + g **E1**

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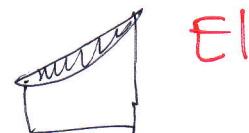
6. $\tan^2 \phi = \frac{1}{3}$ **A1**

$\tan \phi = \pm \sqrt{\frac{1}{3}}$ OR $\pm \frac{\sqrt{3}}{3}$ **A1** MUST HAVE $\pm$

$\boxed{\frac{\pi}{6}}$, $\boxed{\frac{7\pi}{6}}$, $\boxed{\frac{5\pi}{6}}$, $\boxed{\frac{11\pi}{6}}$ **A4**

7.

a) $3^2 - 3^2 - 2 \times 3 \times 3 \cos\frac{\pi}{3}$ OR SIMILAR **M1** $\left(\begin{array}{c}\text{ALTERNATIVE}\\ 3 \sin\frac{\pi}{3}\end{array}\right)$

$\sqrt{27}$ OR $3\sqrt{3}$ **A1**

b) $\frac{1}{2} \times 3 \times 3 \times \sin\frac{2\pi}{3}$ **M1**

$\frac{9}{4}\sqrt{3}$ OR 3.897 **A1**

c) $2\pi - \frac{2\pi}{3}$ OR $\frac{4\pi}{3}$ **B1**

$\frac{1}{2} \times 3^2 \times \frac{4\pi}{3}$ **M1**

6π **A1**

<u>INDICATES</u> SECTOR + TRIANGLE   **E1**
BEFORE IT STATES THE ANSWER

ACCEPT ALTERNATIVE
- FINDS SECTOR **B1**
- FINDS SEGMENT **B1**
- CIRCLE — SEGMENT **B1**
- PRODUCES ANSWER CONVINCINGLY **A1**

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8. a) <u>ATTEMPT</u> TO FIND SURFACE AREA   **B1**

$5x^2 + xy = 60$ **A1**

$V = 150x^2y$ **B1**

SUBSTITUTES FROM ↗ INTO V & GETS ANSWER CONVINCINGLY **A1**

b) $\boxed{900 - 2250x^2}$ $\boxed{= 0}$ **M1 M1**

OBTAINS $x = 2$ ONLY   **A1**

c) SIGHT OF $-4500x$ **B1**

$-9000 < 0$ & <u>STATES</u> MAX   **A1**

d) SUBS "$x=2$" INTO "$5x^2 + xy = 60$" **M1** ft

OBTAINS $y = 20$ **A1**

9. a) $\dfrac{x+12}{x^2} = \dfrac{2x-3}{x+12}$ B1 EITHER RATIO   B1 both correct

$(x+12)^2 = 2x^3 - 3x^2$ M1

$x^2 + 24x + 144 = 2x^3 - 3x^2$

& SIMPLIFIES CONVINCINGLY TO ANSWER   A1

b) $(x-6)(x^2 + 4x + 12)$ A1

SHOWS $4^2 - 4 \times 1 \times 12$ OR   ATTEMPTS SOLUTION OF   M1
$$x^2 + 4x + 12$$

CONCLUDES $x = 6$ IS THE _ONLY_ SOLUTION   A1   dep

c) $\left.\begin{array}{l} a = 36 \\ r = \frac{1}{2} \end{array}\right)$ B1 SEEN OR IMPLIED

$\dfrac{"36"}{1 - "\frac{1}{2}"}$ M1

72 c.a.o   A1

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a) $\left(\dfrac{1}{2}\right)^{\frac{x-4}{3}} = 0.315$ M1

$\log\left(\dfrac{1}{2}\right)^{\frac{x-4}{3}} = \log(0.315)$ M1

SIGHT OF 1.66657 A1

$x = 9$ (a.w.r.t)   A1

b) $\log_2(y+1)^2$ B1

$\log_2\left[\dfrac{8y-1}{(y+1)^2}\right]$ OR $\log\left[\dfrac{8}{y+4}\right]$ B1

$\dfrac{8y-1}{(y+1)^2} = \dfrac{8}{y+4}$ A1

$(8y-1)(y+4) = 8(y+1)^2$ o.e   M1

EXPANDS & SIMPLIFY
E.g $8y^2 + 31y - 4 = 8y^2 + 16y + 8$ M1

$y = \dfrac{4}{5}$ o.e   A1