1. a) $3^3 - 2\times3^2 + k\times3 + 6 = 0$ OR $27 - 18 + 3k + 6 = 0$ M1

$3k = -15$ OR $-3k = 15$ PLUS $k = -5$ A1

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

$(x-3)(x-1)(x+2)$ A1

c) $(-3)^3 - 2(-3)^2 - 5(-3) + 6$ OR $(-6)(-4)(-1)$ M1

-24 A1

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2. a)

x	0	1	2	3	4
y	$\frac{1}{2}$	$\frac{2}{3}$	1	$\frac{8}{5}$	$\frac{8}{3}$

A1

A1 ← allow decimals in rounded form

$\frac{1}{2}\left[\frac{1}{2} + \frac{8}{3} + 2\left(\frac{2}{3} + 1 + \frac{8}{5}\right)\right]$ M1 correct structure ft.

4.85 A1

b) INCREASE THE NUMBER OF STRIPS / TRAPEZIUMS OR EQUIVALENT B1

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3. a) $1 - 20x + 180x^2 - 960x^3$ B3

b) $x = 0.01$ SEEN OR IMPLIED B1

$1 - 0.2 + 0.018 - 0.00096$

OR $1 - 20(0.01) + 180(0.01)^2 - 960(0.01)^3$ M1

0.81704 → MUST SEE THIS FIRST

0.817 → A1

4. a) 1·05 SEEN OR IMPLIED (MAY APPEAR IN (b)) B1

22000×1.05^{29} M1

(£)90555 OR (£)90555·98 A1

b) $\frac{22000(1-1.05^{30})}{1-1.05}$ O.E. M1

(£)1461655 OR (£)1461654·65 A1

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a) $(-3, 1)$ B1

$\sqrt{16+9} = 5$ OR $\sqrt{64+36} = 10$ B1

$(x+3)^2 + (y-1)^2 = 25$ A3 dep on correct structure.

OR

$x^2 + 6x + y^2 - 2y = 15$

b) GRADIENT $-\frac{3}{4}$ SEEN B1

$y - 1 = \frac{4}{3}(x+3)$ M1 A1

OR $3y = 4x + 15$

OR $y = \frac{4}{3}x + 5$

c) ATTEMPTS TO SOLVE SIMULTANEOUSLY

$4y + 3x = 20$ & "THEIR b" M1

D(0, 5) A1 A1

6. $\log_3 x^2$ B1

$\log_3\left(\frac{x^2}{x-9}\right)$ B1

$\frac{x^2}{x-2} = 9$ A1

$x^2 - 9x + 18 = 0$ A1

$(x-3)(x-6)$ A1

$x = 3$ AND 6 A1

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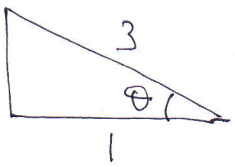
7. a) $9^2 = 6^2 + 5^2 - 2\times6\times5\times\cos\theta$ M1

$60\cos\theta = -20$ O.E A1

$\cos\theta = -\frac{1}{3}$ A1 dep

b) SIGHT OF M1



$\sin\theta = \frac{2}{3}\sqrt{2}$

(ACCEPT $\sin\theta = \frac{\sqrt{8}}{3}$) A1.

ALTERNATIVE

$\left(-\frac{1}{3}\right)^2 + \sin^2\theta = 1$ M1

$\sin\theta = \frac{2}{3}\sqrt{2}$

(ACCEPT $\sin\theta = \frac{\sqrt{8}}{3}$) A1

c) $\frac{\sin\phi}{6} = \frac{\frac{2}{3}\sqrt{2} \text{ OR } \frac{\sqrt{8}}{3}}{24}$ M1

$\sin\phi = \frac{1}{6}\sqrt{2}$ OR EXACT EQUIVALENT A1

8. $\frac{3+6}{2} \times 3$ M1

$\frac{27}{2}$ A1

$\int_3^6 x^2 - 8x + 18 \, dx$ MUST HAVE LIMITS M1

$\left[\frac{1}{3}x^3 - 4x^2 + 18x\right]_3^6$ M1

(SUBS 6 ----) − (SUBS 3 ------) = (9) M1 A1

e.g $(72 - 144 + 108) - (9 - 36 + 54)$

GIVES FINAL ANSWER $\frac{9}{2}$ OE. A1

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9. a) $P = 2x + x\theta$ B1

$\frac{1}{2}x^2\theta = 36$ B1

$x\theta = \frac{72}{x}$ OR $\theta = \frac{72}{x^2}$ M1

SUB INTO THE PRIMITIVE EXPRESSION AND SIMPLIFIES TO ANSWER GIVEN A1

b) $2 - 72x^{-2}$ O.E M1

$2 - 72x^{-2} = 0$ OR WRITES $\frac{dP}{dx} = 0$ B1

ATTEMPTS SOLUTION TO STAGE $2x^2 = 72$ OR FURTHER M1

GIVES ANSWER $x = 6$ AND NO OTHER A1

c) GIVES ANSWER FOR P AS 24 B1

START OF $144x^{-3}$ O.E B1

START OF $\frac{144}{6^3}$ OR $\frac{2}{3}$ | STATES >0 $\therefore$ MINIMUM A1

d) $\frac{72}{6^2} \overset{\text{OR}}{=} \frac{72}{36}$ M1

$\theta = 2^c$ A1

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10. $3\left(\frac{\sin\theta}{\cos\theta}\right)\sin\theta = \cos\theta + 1$ M1

$\frac{3\sin^2\theta}{\cos\theta} = \cos\theta + 1$ M1

$3\sin^2\theta = \cos^2\theta + \cos\theta$ M1

$3(1-\cos^2\theta) = \cos^2\theta + \cos\theta$ M1

$4\cos^2\theta + \cos\theta - 3 \ (=0)$ A1

$(4\cos\theta - 3)(\cos\theta + 1)$ MAY APPEAR AS $(4x-3)(x+1)$ M1

$\cos\theta = \begin{cases} -1 \\ \frac{3}{4} \end{cases}$ BOTH A1

0.72^c 5.56^c 3.14^c OR π A2