1. a) $2x^2 + 7x - 4$ B1

$\pm 4x^2 \pm 24x \pm 36$ M1

$-2x^2 + 31x - 40$ A1 c.a.o

b) $3x^2 + 10x - 8$ B1

$10x^2$ $3kx^2$ SEEN TOGETHER M1

$k = -4$ A1 c.a.o

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2. a) SIGHT OF 1.2 B1

$10 \times "1.2"^9$ M1

51.60 OR £52 WITH full workings A1

b) $10 \times "1.2"^{n-1} > 1000$ B1

$"1.2"^{n-1} > 100$ M1

CORRECT use OF LOGS M1

SIMPLIFIES CORRECTLY & CONVINCINGLY TO THE ANSWER (c.a.o) A1

c) 27 c.a.o 4A1

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3. $\binom{4}{2}(2x)^2k^2$ OR $\binom{4}{3}(2x)^3k$ O.E B1

$24k^2x^2$ OR $32kx^3$ A1

$24k^2 = 12 \times 32k$ O.E M1

$k = 16$ (NOT $k=0$) A1

4. a) TRANSLATION, 4 UNITS, TO THE "RIGHT" o.e M2 -1 eeoo

(NO TRANSLATION M0)

b) 4 c.a.o B1

c) $\log_2 x - \log_2(x-4) = 2$ M1

SIGHT OF $\log_2\left(\frac{x}{x-4}\right)$ M1

$\frac{x}{x-4} = 4$ M1

$x = \frac{16}{3}$ OR $k = \frac{16}{3}$ A1 (WHOLE SOLUTION MAY BE IN t)

5. $x^2 - 1 = 9\left(1 - \frac{1}{x^2}\right)$ B1

$x^4 - 10x^2 + 9 = 0$ o.e M1

$(x^2-1)(x^2-9) = 0$ OR EQUIVALENT M1

ALLOW USE OF OTHER LETTERS

$x = \begin{cases} 1 \\ 3 \end{cases}$ (IGNORE OTHER SOLUTIONS) A1

$\int_1^3 9 - 9x^{-1}\,dx$ OR $\int_1^3 x^2 - 1\,dx$ OR $\int_1^3 10 - 9x^{-2} - x^2\,dx$ (INTEGRATION) M1

(LIMITS) M1

$9x - 9x^{-2}$ OR $\frac{1}{3}x^3 - x$ OR $10x + 9x^{-1} - \frac{1}{3}x^3$ M1

USE OF LIMITS CORRECTLY $[\ldots] - [\ldots]$ M1

SIGHT OF 12 OR $\frac{20}{3}$ OR 24 OR $\frac{56}{3}$ M1

$\frac{16}{3}$ c.a.o A1

6. $10 = 12 + 3\sin\left(\frac{\pi t}{6}\right)$ B1

$\sin\frac{\pi t}{6} = -\frac{2}{3}$ A1

$-0.7297\ldots$ or $-41.81\ldots$ A1

$3.8713\ldots$ or $221.8\ldots$ MA1

SIGHT OF -4.3784, OR 23.2279
OR -1.3937 M1
OR 7.3957

ANSWER $22.606\ldots$ $19.394\ldots$ A1 A1

FINAL ANSWERS $\underline{19:24/22:36}$ ACCEPT P.M NOTATION A1 c.a.o
BOTH

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7. a) CORRECT ATTEMPT EITHER FACTORISE 3 OUT AS 3^2 & DIVIDE BY 9 M1 M1

OR EXPAND, DIVIDE BY 9, REFACTORISE

$\left(0, -\frac{25}{3}\right)$ $r = 5$ A1 A1

b) GRAD AC ATTEMPTED $= -\frac{3}{4}$ o.e M1 A1

"$\frac{4}{3}$" SEEN M1 ft

$y - \text{"}\frac{16}{3}\text{"} = \text{"}\frac{4}{3}\text{"}(x-4)$ M1

$y = \frac{4}{3}x +$ COMMON? A1

c) EITHER USE COSINE RULE $(5, 5, 8)$ OR $\sin\text{"}\phi\text{"} = \frac{4}{5}$ M1

CORRECT STAGE $\cos\theta = -\frac{7}{25}$ OR $\phi = 0.9273$ A1
→ THIN ANSWER ←

d) $\frac{25}{3} \times 4$ OR $\frac{100}{3}$ MA1

$\frac{1}{2} \times \text{"}5\text{"}^2 \times 1.8546 = 23.182\ldots$ M1 A1

AWRT 10.15 A1 c.a.o

8. a) USE OF PYTHAGORAS OR TRIGONOMETRY TO FIND $|EF|$ M1

$|EF| = \frac{\sqrt{2}}{2}x$ O.E A1

$\frac{1}{2}|EF|^2 y = 4$ M1

$x^2 y = 16$ A1

$\left("\frac{\sqrt{2}}{2}x"\right)^2 + 2\left("\frac{\sqrt{2}}{2}x"\right) \times \frac{16}{x^2}$ M1

SIMPLIFIES CORRECTLY & CONVINCINGLY TO THE ANSWER GIVEN A1

b) $\left(\frac{dA}{dx} =\right) x - 16\sqrt{2}x^{-2}$ M1

$"x - 16\sqrt{2}x^{-2}" = 0$ M1

ATTEMPTS SOLUTION M1

$x^3 = 16\sqrt{2}$ A1

$x = 2\sqrt{2}$ A1

c) $\left(\frac{d^2y}{dx^2} =\right) 1 + 32\sqrt{2}x^{-3}$ M1

SUB $x = "2\sqrt{2}"$ INTO $\frac{d^2y}{dx^2}$ OBTAINS 3 (POSITIVE) & STATES MINIMUM A1

d) $\frac{1}{2}("2\sqrt{2}")^2$ M1

12 C.A.O A1

e) $\frac{\sqrt{2}}{2} \times 2\sqrt{2} = 2$ A1

$\frac{16}{(2\sqrt{2})^2} = 2$ A1

MUST USE EXACT SURDS