1. a I) SIGHT OF $\frac{195}{200}$ OR 0.975 (MAY APPEAR IN a II) B1

$200 \times "0.975"^{115}$ M1

176.219... A1

II) $\frac{200\left(1-"0.975"^{112}\right)}{1-"0.975"}$ M1

2096.01.... A1

34.933... A1

b) $200 \times 0.975^{n-1} < 120$ M1

$0.975^{n-1} < 0.6$ M1

USES LOGS CORRECTLY M1

$n = 22$ dep on sight of 21.17... OR $\frac{\log 0.6}{\log 0.975} + 1$ A1

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2. a) $32x^5 - 320x^4 + 1280x^3 - 2560x^2 + 2560x - 1024$ A4 -1 eeoo

b) SIGHT OF $x = \frac{1}{8}y$ OR $2560\left(\frac{1}{8}y\right)^2$ M1

$40y^2$ OR 40 A1

c) $(2z^2-4)^5$ B1

SIGHT OF $320(z^2)^4$ M1

$-320z^8$ OR -320 A1

3. $\log_2 x + 2\log_2 y = 0$ $\quad X + 2Y = 0$ B1

$2\log_2 x + \log_2 y = 3$ OR $2X + Y = 3$ OR SIMILAR B1

SOLVES ABOVE LINEAR EQUATIONS M1

$X = 2, Y = -1$ OR $\log_2 x = 2, \log_2 y = -1$ A1 (both)

$x = 4, y = \frac{1}{2}$ A1 (both)

ALTERNATIVE

$xy^2 = 2^0$ B1

$x^2 y = 2^3$ B1

SOLVES EQUATIONS, SENSIBLE ATTEMPT BY SUBSTITUTION OR DIVISION M1

$x = 4$ A1

$y = \frac{1}{2}$ A1

4) a) $8 + 4(a+2) - 4 + b = 0$

$(-a)^3 + (a+2)(-a)^2 - 2(a) + b = 0$ } M1 EITHER

$4a + b + 12 = 0$

$2a^2 + 2a + b = 0$ } M1 (EITHER)

M1 SENSIBLE ELIMINATION OF b

$a^2 - a - 6 = 0$ (o.e) A1

$a = \begin{cases} 3 \\ -2 \end{cases}$ A1

$b = -24$ A1

b) $(x-2)(x+3)(x+4)$ MA1

$x = \begin{cases} 2 \\ -3 \\ 4 \end{cases}$ All 3 A1

5. $\left(\frac{dy}{dx} =\right) 1 - 8x^3$ M1

"$1 - 8x^3 = 0$" M1

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

$y = \frac{3}{8}$ A1

$\int_0^{"\frac{1}{2}"} x - 2x^4 \, dx$ M2 (1 mark for limits)

$\frac{1}{2}x^2 - \frac{2}{5}x^5$ M1

SIGHT OF $\frac{9}{80}$ A1

$\frac{3}{16} - \frac{9}{80}$ OR $\frac{3}{40}$ A1

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6. a) 36000 B1 c.a.o

b) $\frac{dP}{dt} = 8t^{-\frac{1}{2}} - 27t^{-2}$

$\frac{dP}{dt} > 0$ OR $8t^{-\frac{1}{2}} - 27t^{-2} > 0$ B1

O.E

$t^{\frac{3}{2}} > \frac{27}{8}$ M1

$t > \frac{9}{4}$ c.a.o A1

(OR $2\frac{1}{4}$, 2.25)

7. a) $-2 = \sqrt{3} - \tan(2\times 52.5 - \alpha)$ o.e M1

$\tan(105-\alpha) = 2+\sqrt{3}$ A1

$105-\alpha = 75$ o.e M1

$\alpha = 30$ STA71D dep A1

b) $\sqrt{3} - \tan(2x-30) = 0$ o.e M1

$2x - 30 = 60$ M1

$x = 45$ or $(45,0)$ A1

$x = 135$ or $(135,0)$ A1

c) $A\left(0, \frac{4}{3}\sqrt{3}\right)$

$B\left(180, \frac{4}{3}\sqrt{3}\right)$ A2 (-1 ft no labels)

d) 90 or 90° A1

e) $x = 60$ or $x = 60$ A1

$x = 150$ $x = 150°$ A1

8. a) ATTEMPT TO FIND $|AC|$ E.g $\sqrt{(6-5)^2+(3-1)^2}$

(RADIUS =) $\sqrt{5}$

b) $p = 5$

$q = 5$

c) GRAD AC = $\frac{6-5}{3-1}$ OR STATES GRAD IS $\frac{1}{2}$ B1

IMPLIES REQUIRED GRAD IS "-2" B1

$y - 5 = "-2"(x-1)$ O.E E.G $y = -2x + 7$ M1

d) USE OF COSINE RULE ON ABC M1

$10\cos\theta = -6$ O.E A1

$\theta = 2.214$ dep on $\cos\theta = -\frac{3}{5}$ O.E A1

ALTERNATIVE $\sin"\phi" = \frac{2}{\sqrt{5}}$ M1

$\phi = 1.107\ldots$ A1

$\theta = 2\phi = 2 \times 1.107 = 2.214\ldots$ A1

e) IMPLIES D(3,1) B1

IMPLIES $|CD| = 5$ A1

AREA OF TRIANGLE = 5
OR
AREA OF KITE = 10 } MA1

$\frac{1}{2} \times (\sqrt{5})^2 \times 2.214$ M1

AWRT 4.64 A1

ALTERNATIVE FOR FIRST 3 MARKS

$\frac{2}{\sqrt{5}} = \tan(1.107\ldots)$ M1

$x = 2\sqrt{5}$ OR $4.472\ldots$ A1

AREA = $\frac{1}{2} \times \sqrt{5} \times 4.472$ ($\sqrt{5}$)
+ SIGHT OF ANSWER WHICH ROUNDS TO 5.00 A1