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1 (i) Introduce logarithms and use power law   M1

Obtain $x = 21.6$ A1   [2]

(ii) Obtain or imply –21.6 or –21 as lower value   B1

State 43   B1   [2]

2 (i) Substitute $x = -2$ into expression and equate to zero   M1

Obtain $-32 + 4a + 2(a+1) - 18 = 0$ or equivalent   A1

Obtain $a = 8$ A1   [3]

(ii) Attempt to find quadratic factor by division, inspection, …   M1

Obtain $4x^2 - 9$ A1

State $(x+2)(2x-3)(2x+3)$ A1   [3]

3 (i) Use identity $\sec^2\theta = 1 + \tan^2\theta$ B1

Solve three-term quadratic equation in $\tan\theta$ M1

Obtain at least $\tan\theta = \dfrac{5}{2}$ A1   [3]

(ii) Substitute numerical values into $\tan(A+B)$ identity   M1

Obtain $\dfrac{\frac{5}{2} + (-1)}{1 - \frac{5}{2}(-1)}$ or equivalent, following their positive answer from part (i)   A1

Obtain $\dfrac{3}{7}$ or exact equivalent and no other answers   A1   [3]

4 (i) Differentiate to obtain $e^x - 8e^{-2x}$ B1

Use correct process to solve equation of form $ae^x + be^{-2x} = 0$ M1

Confirm given answer $\ln 2$ correctly   A1   [3]

(ii) Integrate to obtain expression of form $pe^x + qe^{-2x}$ M1

Obtain correct $e^x - 2e^{-2x}$ A1

Apply both limits correctly   M1 depM

Confirm given answer $\dfrac{5}{2}$ A1   [4]

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5 (i) Draw recognisable sketch of $y = 16 - x^4$ — B1

Draw recognisable sketch of $y = |3x|$ — B1

Indicate in some way the two points of intersection — B1 depBB
[3]

(ii) Use iterative process correctly at least once — M1

Obtain final answer 1.804 — A1

Show sufficient iterations to justify answer or show sign change in the
interval (1.8035, 1.8045) — A1 [3]

(iii) State $(1.804, 5.412)$ — B1

State $(-1.804, 5.412)$, following their first point — B1✓ [2]

6 (i) Solve three-term quadratic equation for $\sin x$ — M1

Obtain at least $\sin x = -\frac{1}{2}$ and no errors seen — A1

Obtain $x = \frac{7}{6}\pi$ — A1 [3]

(ii) State $\sin^2 x = \frac{1}{2} - \frac{1}{2}\cos 2x$ — B1

Obtain given $5 + 8\sin x - 2\cos 2x$ with necessary detail seen — B1

Integrate to obtain expression of form $ax + b\cos x + c\sin 2x$ — M1

Obtain correct $5x - 8\cos x - \sin 2x$ — A1

Apply limits 0 and their x-value correctly — M1 depM

Obtain $\frac{35}{6}\pi + \frac{7}{2}\sqrt{3} + 8$ or exact equivalent — A1 [6]

7 (a) Differentiate $4\ln y$ to obtain $\dfrac{4}{y} \times \dfrac{dy}{dx}$ — B1

Differentiate $6xy$ to obtain $6y + 6x\dfrac{dy}{dx}$ — B1

Substitute 1 and 1 and solve for $\dfrac{dy}{dx}$ — M1

Obtain $-\dfrac{9}{10}$ or equivalent — A1 [4]

(b) Obtain $\dfrac{dx}{dt} = -10t^{-2} - 1$ — B1

Obtain derivative of form $k(2t-1)^{-\frac{1}{2}}$ for $\dfrac{dy}{dt}$ — M1

Obtain correct $(2t-1)^{-\frac{1}{2}}$ — A1

Identify value of t as 5 — B1

Obtain expression for $\dfrac{dy}{dx}$ correctly, with numerical value of t substituted — M1

Obtain $-\dfrac{5}{21}$ or exact equivalent — A1 [6]

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