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 $\tan\theta = \frac{5}{2}$ — A1 [3]

(ii) Substitute numerical values into $\tan(A+B)$ identity — M1
Obtain $\frac{\frac{5}{2} + (-1)}{1 - \frac{5}{2}(-1)}$ or equivalent, following their positive answer from part (i) — A1
Obtain $\frac{3}{7}$ 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 $\frac{5}{2}$ — A1 [4]

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 $\frac{4}{y} \times \frac{\mathrm{d}y}{\mathrm{d}x}$ B1

Differentiate $6xy$ to obtain $6y + 6x\frac{\mathrm{d}y}{\mathrm{d}x}$ B1

Substitute 1 and 1 and solve for $\frac{\mathrm{d}y}{\mathrm{d}x}$ M1

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

(b) Obtain $\frac{\mathrm{d}x}{\mathrm{d}t} = -10t^{-2} - 1$ B1

Obtain derivative of form $k(2t-1)^{-\frac{1}{2}}$ for $\frac{\mathrm{d}y}{\mathrm{d}t}$ M1

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

Identify value of t as 5 B1

Obtain expression for $\frac{\mathrm{d}y}{\mathrm{d}x}$ correctly,with numerical value of t substituted M1

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