1 State or imply correct y–values 6, 4, 0, 8, 24 — B1
Use correct formula, or equivalent, with $h = 1$ and five y–values — M1
Obtain 27 — A1 [3]

2 State or imply $\ln y = \ln a + x\ln b$ — B1
Equate $\ln b$ to numerical gradient of line — M1
Obtain $b = 1.85$ — A1
Substitute to find value of a — M1
Obtain $a = 3.45$ — A1 [5]

3 **(a)** Express integrand in the form $p\cos\theta + 2$ — M1
State correct $2\cos\theta + 2$ — A1
Integrate to obtain $2\sin\theta + 2\theta$ $(+ c)$ — A1 [3]

(b) Integrate to obtain form $k\ln(2x+3)$ — M1
Obtain correct $\frac{1}{2}\ln(2x+3)$ — A1
Apply limits correctly — DM1
Obtain $\frac{1}{2}\ln 15$ — A1 [4]

4 **(i)** Differentiate to obtain form $k_1\sin 2x + k_2\cos x$ — M1
Obtain correct $-6\sin 2x - 5\cos x$ — A1
Substitute $\frac{1}{6}\pi$ to obtain $-\frac{11}{2}\sqrt{3}$ or exact equivalent — A1 [3]

(ii) Obtain $6y + 6x\frac{\mathrm{d}y}{\mathrm{d}x}$ as derivative of $6xy$ — B1
Obtain $3y^2\frac{\mathrm{d}y}{\mathrm{d}x}$ as derivative of y^3 — B1
Obtain $3x^2 + 6y + 6x\frac{\mathrm{d}y}{\mathrm{d}x} + 3y^2\frac{\mathrm{d}y}{\mathrm{d}x} = 0$ or equivalent — B1
Substitute 1 and 2 to find value of gradient dependent on at least one B1 — M1
Obtain gradient $-\frac{15}{18}$ or $-\frac{5}{6}$ — A1 [5]

5 **(i)** State $-40 + 4a + b = 0$ or equivalent — B1
State $-135 + 9a + b = 0$ or equivalent — B1
Solve a pair of linear simultaneous equations — M1
Obtain $a = 19$ and $b = -36$ — A1 [4]

(ii) Identify $5x - 6$ as a factor — B1
State $(x+2)(x+3)(5x-6)$ — B1
State or imply $5^y = \frac{6}{5}$, following a positive value from factorisation — B1√
Apply logarithms and use power law — M1
Obtain 0.113 only — A1 [5]

6 **(i)** Use quotient rule or equivalent M1

Obtain $\dfrac{2x\left(1+e^{3x}\right)-3x^2e^{3x}}{\left(1+e^{3x}\right)^2}$ or equivalent A1

Equate first derivative to zero and attempt rearrangement to $x = \ldots$ DM1

Obtain $x=\dfrac{2}{3}\left(1+e^{-3x}\right)$ with sufficient detail and no errors seen (AG) A1 [4]

(ii) Consider sign of $x-\dfrac{2}{3}\left(1+e^{-3x}\right)$ at 0.7 and 0.8 or equivalent M1

Obtain correct values (–0.05 and 0.07 or equivalents) and conclude appropriately A1 [2]

(iii) Use the iterative formula correctly at least once M1

Obtain final answer 0.739 A1

Show sufficient iterations to 5 decimal places to justify result or show a sign change in the interval (0.7385, 0.7395) A1 [3]

7 **(i)** Use $\sec^2\alpha = 1+\tan^2\alpha$ B1

Confirm $3\tan^2\alpha+4\tan\alpha-4=0$ B1

Solve quadratic equation for $\tan\alpha$ M1

Obtain, finally, $\tan\alpha=\dfrac{2}{3}$ only A1 [4]

(ii) State or imply $\tan\left(\alpha+\beta\right)=\dfrac{1}{6}$ B1

State $\dfrac{\frac{2}{3}+\tan\beta}{1-\frac{2}{3}\tan\beta}=\dfrac{1}{6}$, following their value of $\tan\alpha$ B1√

Solve equation of form $\dfrac{a+bt}{c+dt}$ for t M1

Obtain $\tan\beta=-\dfrac{9}{20}$ A1

Conclude with $\cot\beta=-\dfrac{20}{9}$ or exact equivalent A1 [5]