1 **EITHER** State or imply non-modular inequality $(x+2)^2 > \left(\frac{1}{2}x-2\right)^2$, or corresponding equation or pair of linear equations M1
Make reasonable solution attempt at a 3-term quadratic, or solve two linear equations M1
Obtain critical values –8 and 0 A1
State correct answer $x < -8$ or $x > 0$ A1

OR Obtain one critical value, e.g. $x = -8$, by solving a linear equation (or inequality) or from a graphical method or by inspection B1
Obtain the other critical value similarly B2
State correct answer $x < -8$ or $x > 0$ B1 [4]

2 Use law for the logarithm of a product, a quotient or a power M1*
Obtain $(x+1)\log 4 = (2x-3)\log 5$, or equivalent A1
Solve for x M1(dep*)
Obtain answer $x = 3.39$ A1 [4]

3 **(i)** Obtain correct derivative B1
Obtain $x = 2$ only B1 [2]

(ii) State or imply correct ordinates 0.61370..., 0.80277..., 1.22741..., 1.78112... B1
Use correct formula, or equivalent, correctly with $h = 1$ and four ordinates Ml
Obtain answer 3.23 with no errors seen Al [3]

(iii) Justify statement that the trapezium rule gives an over-estimate B1 [1]

4 State at least one correct integral B1
Use limits correctly to obtain an equation in e^{2k}, e^{4k} M1
Carry out recognizable solution method for quadratic in e^{2k} M1
Obtain $e^{2k} = 1$ and $e^{2k} = 3$ A1
Use logarithmic method to solve an equation of the form $e^{\lambda a} = b$, where $b > 0$ M1
Obtain answer $k = \frac{1}{2}\ln 3$ A1 [6]

5 **(i)** Make a recognisable sketch of a relevant graph, e.g. $y = \sin x$ or $y = \frac{1}{x}$ B1
Sketch a second relevant graph and justify the given statement B1 [2]

(ii) Consider sign of $\frac{1}{x} - \sin x$ at $x = 1.1$ and $x = 1.2$, or equivalent M1
Complete the argument correctly with appropriate calculations A1 [2]

(iii) Use the iterative formula correctly at least once M1
Obtain final answer 1.11 A1
Show sufficient iterations to justify its accuracy to 2 d.p. or show there is a sign change in the interval (1.105, 1.115) B1 [3]

6 **(i)** State $\frac{dx}{dt} = 4\sin\theta\cos\theta$ or equivalent (nothing for $\frac{dy}{dx} = 4\sec^2\theta$) B1

Use $\frac{dy}{dx} = \frac{dy}{d\theta} \div \frac{dx}{d\theta}$ M1

Obtain given answer correctly A1 [3]

(ii) Substitute $\theta = \frac{\pi}{4}$ in $\frac{dy}{dx}$ and both parametric equations M1

Obtain $\frac{dy}{dx} = 4$ and coordinates (2, 4) A1

Form equation of tangent at their point M1

State equation of tangent in correct form $y = 4x - 4$ A1 [4]

7 **(i)** Substitute $x = -2$, equate to zero and obtain a correct equation in any form B1

Substitute $x = -1$ and equate to 12 M1

Obtain a correct equation in any form A1

Solve a relevant pair of equations for a or b M1

Obtain $a = 2$ and $b = 6$ A1 [5]

(ii) Attempt division by $x + 2$ and reach a partial quotient of $2x^2 - 7x$ M1

Obtain quotient $2x^2 - 7x + 3$ A1

Obtain linear factors $2x - 1$ and $x - 3$ A1

[Condone omission of repetition that $x + 2$ is a factor.)

[If linear factors $2x - 1$, $x - 3$ obtained by remainder theorem or inspection, award B2 + B1.]

S.C. M1A1√ if a, b not both correct [3]

8 **(i)** State $R = \sqrt{34}$ B1

Use trig formula to find α M1

Obtain $\alpha = 30.96°$ with no errors seen A1 [3]

(ii) Carry out evaluation of $\cos^{-1}\left(\frac{\pm 4}{R}\right)$ ($\approx 46.6861°$ or $313.3139°$) M1

Obtain answer 15 .7° A1

Carry out correct method for second answer M1

Obtain answer 282.3° or 282.4° and no others in the range A1 [4]

(iii) State $-3\sqrt{34}$ $(= -3R)$ B1√ [1]