1 Either State or imply non-modular inequality $(x+1)^2 < (3x+5)^2$, 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 −2 and $-\frac{3}{2}$ A1
State correct answer $x < -2$ or $x > -\frac{3}{2}$ A1

Or Obtain one critical value, e.g. $x = -2$, 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 $x < -2$ or $x > -\frac{3}{2}$ B1 [4]

2 **(i)** Consider sign of $x^4 + 2x - 9$ at $x = 1.5$ and $x = 1.6$ M1
Complete the argument correctly with appropriate calculations A1 [2]
$(f(1.5) = -0.9375, f(1.6) = 0.7536)$

(ii) Rearrange $x^4 + 2x - 9 = 0$ to given equation or *vice versa* B1 [1]

(iii) Use the iterative formula correctly at least once M1
Obtain final answer 1.56 A1
Show sufficient iterations to justify its accuracy to 2 d.p. B1 [3]

$x_o = 1.5$	$x_o = 1.55$	$x_o = 1.6$
1.5874	1.5614	1.5362
1.5424	1.5556	1.5685
1.5653		1.5520
1.5536		1.5604
1 5595		1.5561
1.5565		

or show there is a sign change in the interval (1.555, 1.565)

3 Obtain derivative $e^{2x} - 5e^x + 4$ B1
Equate derivative to zero and carry out recognisable solution method for a quadratic in e^x M1
Obtain $e^x = 1$ or $e^x = 4$ A1
Obtain $x = 0$ and $x = \ln 4$ A1
Use an appropriate method for determining nature of at least one stationary point M1
$\left(\frac{d^2y}{dx^2} = 2e^{2x} - 5e^x, \text{when } x = 0, \frac{d^2y}{dx^2} = -(3),\ x = \ln 4, \frac{d^2y}{dx^2} = +(12)\right)$
Conclude maximum at $x = 0$ and minimum at $x = \ln 4$ (no errors seen) A1 [6]

4 **(i)** Substitute $x = 3$ and equate to 14 $(9a + 3b + 35 = 14)$ M1
Substitute $x = -2$ and equate to 24 $(4a - 2b = 24)$ M1
Obtain a correct equation in any form A1
Solve a relevant pair of equations for a or for b M1
Obtain $a = 1$ and $b = -10$ A1 [5]

(ii) Attempt division by $x^2 + 2x - 8$ and reach a partial quotient of $x - k$ M1
Obtain quotient $x - 1$ with no errors seen (can be done by observation) A1
Correct solution method for quadratic e.g. factorisation M1
All solutions $x = 1$, $x = 2$ and $x = -4$ given and no others CWO A1 [4]

5 **(i)** State $\frac{\mathrm{d}x}{\mathrm{d}\theta} = -2\sin 2\theta + \sin\theta$ or $\frac{\mathrm{d}y}{\mathrm{d}\theta} = 8\sin\theta\cos\theta$ B1

Use $\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{\mathrm{d}y}{\mathrm{d}\theta} \div \frac{\mathrm{d}x}{\mathrm{d}\theta}$ M1
Use $\sin 2\theta = 2\sin\theta\cos\theta$ M1
Obtain given answer correctly A1 [4]

(ii) Equate derivative to −4 and solve for $\cos\theta$ M1
Obtain $\cos\theta = ½$ A1
Obtain $x = -1$ A1
Obtain $y = 3$ A1 [4]

6 **(a)** **(i)** Attempt to divide by e^{2x} and attempt to integrate 2 terms M1
Integrate a term of form ke^{-2x} correctly A1√
Fully correct integral $x - 3e^{-2x}$ $(+c)$ A1 [3]

(ii) State correct expression $\frac{1}{2}\cos 2x + \frac{1}{2}$ or equivalent B1
Integrate an expression of the form $a + b\cos 2x$, where $ab \neq 0$, correctly M1
State correct integral $\frac{3\sin 2x}{4} + \frac{3x}{2}(+c)$ A1 [3]

(b) State or imply correct ordinates 5.46143…, 4.78941…, 4.32808… B1
Use correct formula, or equivalent, correctly with $h = 0.5$ and three ordinates M1
Obtain answer 4.84 with no errors seen A1 [3]

7 **(i)** State $R = \sqrt{10}$ B1
Use trig formula to find α M1
Obtain $\alpha = 18.43^0$ with no errors seen A1 [3]

(ii) Carry out evaluation of $\cos^{-1}\left(\frac{2}{R}\right)$ $\left(\approx 50.77^0\right)$ M1

Carry out correct method for one correct answer M1
Obtain one correct answer e.g. 34.6° A1
Carry out correct method for a further answer M1
Obtain remaining 3 answers 163.8°, 214.6°, 343.8° and no others in the range A1 [5]