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1 Attempt division at least as far as quotient $2x^2 + kx$ **M1**
Obtain quotient $2x^2 - x + 2$ **A1**
Obtain remainder 6 **A1** [3]

Special case: Use of Remainder Theorem to give 6 **B1**

2 Either State or imply non-modular inequality $(x-5)^2 < (2x+3)^2$ or corresponding pair of linear equations **B1**
Attempt solution of 3-term quadratic equation or of 2 linear equations **M1**
Obtain critical values -8 and $\frac{2}{3}$ **A1**
State answer $x < -8, \quad x > \frac{2}{3}$ **A1**

Or Obtain critical value -8 from graphical method, inspection, equation **B1**
Obtain critical value $\frac{2}{3}$ similarly **B2**
State answer $x < -8, \quad x > \frac{2}{3}$ **B1** [4]

3 Use $2\ln x = \ln x^2$ **B1**
Use law for addition or subtraction of logarithms **M1**
Obtain $x^2 = (3+x)(2-x)$ or equivalent with no logarithms **A1**
Solve 3-term quadratic equation **M1**
Obtain $x = \frac{3}{2}$ and no other solutions **A1** [5]

4 **(i)** Use the iterative formula correctly at least once **M1**
Obtain final answer 1.516 **A1**
Show sufficient iterations to justify accuracy to 3 dp or show sign change in interval $(1.5155, 1.5165)$ **B1** [3]

(ii) State equation $x = \sqrt{\frac{1}{2}x^2 + 4x^{-3}}$ or equivalent **B1**
Obtain exact value $\sqrt[5]{8}$ or $8^{0.2}$ **B1** [2]

5 Obtain integral of form ke^{2x+1} **M1**
Obtain correct $3e^{2x+1}$ **A1**
Apply both limits correctly and rearrange at least to $e^{2a+1} = ...$ **M1**
Use logarithms correctly to find a **M1**
Obtain 1.097 **A1** [5]

6 **(i)** Use product rule to obtain expression of form $k_1e^{-x}\sin 2x + k_2e^{-x}\cos 2x$ **M1**

Obtain correct $-3e^{-x}\sin 2x + 6e^{-x}\cos 2x$ **A1**

Substitute $x = 0$ in first derivative to obtain equation of form $y = mx$ **M1**

Obtain $y = 6x$ or equivalent with no errors in solution **A1** [4]

(ii) Equate first derivative to zero and obtain $\tan 2x = k$ **M1***

Carry out correct process to find value of x **dep M1***

Obtain $x = 0.554$ **A1**

Obtain $y = 1.543$ **A1** [4]

7 **(i)** State $3y^2\dfrac{dy}{dx}$ as derivative of y^3 **B1**

Equate derivative of left-hand side to zero and solve for $\dfrac{dy}{dx}$ **M1**

Obtain $\dfrac{dy}{dx} = -\dfrac{6x^2}{3y^2}$ or equivalent **A1**

Observe x^2 and y^2 never negative and conclude appropriately **A1** [4]

(ii) Equate first derivative to -2 and rearrange to $y^2 = x^2$ or equivalent **B1**

Substitute in original equation to obtain at least one equation in x^3 or y^3 **M1**

Obtain $3x^3 = 24$ or $x^3 = 24$ or $3y^3 = 24$ or $-y^3 = 24$ **A1**

Obtain $(2, 2)$ **A1**

Obtain $(\sqrt[3]{24}, -\sqrt[3]{24})$ or $(2.88, -2.88)$ and no others **A1** [5]

8 **(i)** State $2\sin x\cos x \,.\, \dfrac{\cos x}{\sin x}$ **B1**

Simplify to confirm $2\cos^2 x$ **B1** [2]

(ii) **(a)** Use $\cos 2x = 2\cos^2 x - 1$ **B1**

Express in terms of $\cos x$ **M1**

Obtain $16\cos^2 x + 3$ or equivalent **A1**

State 3, following their expression of form $a\cos^2 x + b$ **A1** [4]

(b) Obtain integrand as $\dfrac{1}{2}\sec^2 2x$ **B1**

Integrate to obtain form $k\tan 2x$ **M1***

Obtain correct $\dfrac{1}{4}\tan 2x$ **A1**

Apply limits correctly **dep M1***

Obtain $\dfrac{1}{4}\sqrt{3} - \dfrac{1}{4}$ or exact equivalent **A1** [5]