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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **1a** |  | **B1**  **M1**  **A1** | 5.4  5.4  5.4 | 4th  Integrate functions using partial fractions with linear denominators |
|  | **(3)** |  |  |
| **1b** |  | **M1**  **A1**  **A1**  **A1** | 5.4  5.4  5.4  5.4 | 4th  Integrate functions using partial fractions with linear denominators |
|  | **(4)** |  |  |
| (7 marks) | | | | |
| Notes  **1b M1** Integrates to obtain logs  **A1** One term correct  **A1** Both terms correct  **A1** Combines terms, including the “”, using laws of logarithms | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **2a** |  | **M1**  **M1**  **A1**  **A1** | 5.2  5.2  5.2  5.2 | 5th  Evaluate integrals which extend to infinity |
|  | **(4)** |  |  |
| **2b** |  | **M1**  **M1**  **A1**  **A1**  **A1** | 5.2  5.2  5.2  5.2  5.2 | 6th  Integrate functions across limits which include values where the function is undefined |
|  | **(5)** |  |  |
| (9 marks) | | | | |
| Notes  **2a M1** Use of limit  **M1** Integrates  **A1** Evaluates values  **A1** cao  **2b M1** Splits integral into two parts  **M1** Integrates  **A1** Uses limits twice  **A1** Evaluates values  **A1** cao | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **3a** |  | **M1**  **A1**  **A1** | 5.1  5.1  5.1 | 7th  Find volumes of revolution when given functions in parametric form |
|  | **(3)** |  |  |
| **3b** |  | **M1**  **M1**  **A1**  **A1**  **A1** | 5.1  5.1  5.1  5.1  5.1 | 7th  Find volumes of revolution when given functions in parametric form |
|  | **(5)** |  |  |
| **3c** |  | **M1**  **A1** | 5.1  5.1 | 7th  Find volumes of revolution when given functions in parametric form |
|  | **(2)** |  |  |
| (10 marks) | | | | |

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| Notes  **3a M1** Use of parametric form of volume  **A1**  Differential correct  **A1** Substitutes into formula correctly (A.G.)  **3b M1** Substitutes for  **M1** Attempts to integrate  **A1** Both terms correct  **A1** Evalutes  **A1** cao  **3c M1** Uses Mass = Density × Volume  **A1** cao (3 sf or better) |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **4ai** |  | **M1**  **A1**  **M1**  **M1**  **A1** | 5.5  5.5  5.5  5.5  5.5 | 6th  Be able to differentiate inverse trigonometric functions using chain, product and quotient rules |
|  | **(5)** |  |  |
| **4aii** |  | **B1**  **B1** | 5.5  5.5 | 6th  Be able to differentiate inverse trigonometric functions using chain, product and quotient rules |
|  | **(2)** |  |  |

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| **4b** | Therefore minimum | **M1**  **M1**  **M1**  **A1**  **A1**  **M1**  **A1** | 5.5  5.5  5.5  5.5  5.5  5.5  5.5 | 6th  Be able to differentiate inverse trigonometric functions using chain, product and quotient rules |
|  | **(7)** |  |  |
| (14 marks) | | | | |
| Notes  **4ai** **M1** Uses standard result and chain rule  **A1** Correct  **M1** Uses reciprocal  **M1** Uses  **A1** cao  **4aii** **B1** Uses chain rule or previous result  **B1** cao  **4b M1** Differentiates  **M1** Sets  **M1** Obtains equation as polynomial in *x*  **A1**  **A1**  **M1** Differentiates again  **A1** Shows  and conclusion | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **5a** |  | **B1**  **B1**  **M1**  **A1**  **A1** | 5.6  5.6  5.6  5.6  5.6 | 6th  Choose appropriate trigonometric substitutions to integrate given functions |
|  | **(5)** |  |  |
| **5b** | Mean value | **M1**  **A1**  **A1** | 5.3  5.3  5.3 | 6th  Evaluate the mean value of a function |
|  | **(3)** |  |  |
| **5c** | Mean value | **M1**  **A1** | 5.3  5.3 | 6th  Evaluate the mean value of a function |
|  | **(2)** |  |  |
| (10 marks) | | | | |
| Notes  **5a B1** Differentiates  **B1** Substitutes for *x*  **M1** Simplifies expression and integrates  **A1** Answer in terms of *u*  **A1** Answer in terms of *x*  **5b M1** Correct use of formula  **A1** Substitutes values into limits  **A1** Simplifies correctly  **5c M1** Adds  **A1** cao  Alternative for **5b**  Changes limits to *u* | | | | |