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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **1a** | Rearranges to find | **M1** | 1.1b | 5th  Understand the concept of roots of equations. |
| Statesand thereforeandor states | **A1** | 1.1b |
|  | **(2)** |  |  |
| **1b** | Attempts to use iterative procedure to find subsequent values. | **M1** | 1.1b | 6th  Solve equations approximately using the method of iteration. |
| Correctly finds: | **A1** | 1.1b |
|  | **(2)** |  |  |
| **1c** | Demonstrates an understanding that the two values of f(*x*) to be calculated are for *x* = –2.7815 and *x* = –2.7825. | **M1\*** | 2.2a | 5th  Use a change of sign to locate roots. |
| Finds and | **M1** | 1.1b |
| Change of sign and continuous function in the interval root | **A1** | 2.4 |
|  | **(3)** |  |  |
| (7 marks) | | | | |
| Notes  **1b**  Award M1 if finds at least one correct answer.  **1c**  Any two numbers that produce a change of sign, where one is greater than –2.782 and one is less than –2.782, and both numbers round to –2.782 to 3 decimal places, are acceptable. Minimum required is that answer states there is a sign change in the interval and that this implies a root in the given interval. | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **2a** | Deduces fromthat | **M1** | 1.1b | 5th  Understand the concept of roots of equations. |
| States | **M1** | 1.1b |
| Multiplies by 63 and then takes the cube root: | **A1** | 1.1b |
|  | **(3)** |  |  |
| **2b** | Attempts to use iterative procedure to find subsequent values. | **M1** | 1.1b | 6th  Solve equations approximately using the method of iteration. |
| Correctly finds: | **A1** | 1.1b |
|  | **(2)** |  |  |
| (5 marks) | | | | |
| Notes  **2b**  Award M1 if finds at least one correct answer. | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **3a** | Finds and | **M1** | 1.1b | 5th  Use a change of sign to locate roots. |
| Change of sign and continuous function in the interval root | **A1** | 2.4 |
|  | **(2)** |  |  |
| **3b** | Makes an attempt to differentiate f(*x*) | **M1** | 2.2a | 6th  Solve equations approximately using the Newton-Raphson method. |
| Correctly finds | **A1** | 1.1b |
| Finds and | **M1** | 1.1b |
| Attempts to find | **M1** | 1.1b |
| Finds | **A1** | 1.1b |
|  | **(5)** |  |  |
| (7 marks) | | | | |
| Notes  **3a**  Minimum required is that answer states there is a sign change in the interval and that this implies a root in the given interval. | | | | |

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| Q | Scheme | | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **4a** | **C:\Users\Haremi_0228\Desktop\Images\alevel_ut_p2_u9_test_aw2.png** | Attempts to sketch both and | **M1** | 3.1a | 5th  Understand the concept of roots of equations. |
| States thatmeetsin just one place, therefore has just one root  has just one root | | **A1** | 2.4 |
|  | | **(2)** |  |  |
| **4b** | Makes an attempt to rearrange the equation. For example, | | **M1** | 1.1b | 5th  Understand the concept of roots of equations. |
| Shows logical progression to state  For example,is seen. | | **A1** | 1.1b |
|  | | **(2)** |  |  |
| **4c** | Attempts to use iterative procedure to find subsequent values. | | **M1** | 1.1b | 6th  Solve equations approximately using the method of iteration. |
| Correctly finds: | | **A1** | 1.1b |
|  | | **(2)** |  |  |

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| **4d** | Correctly finds | **A1** | 2.2a | 6th  Solve equations approximately using the Newton–Raphson method. |
| Findsand | **M1** | 1.1b |
| Attempts to find: | **M1** | 1.1b |
| Finds | **A1** | 1.1b |
|  | **(4)** |  |  |
| (10 marks) | | | | |
| Notes  **4a**  Uses their graphing calculator to sketch(**M1**)  **C:\Users\Haremi_0228\Desktop\Images\alevel_ut_p2_u9_test_aw3.png**  States that as g(*x*) only intersects the *x*-axis in one place, there is only one solution. (**A1**)  **4c**  Award M1 if finds at least one correct answer. | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **5a** | Findsand | **M1** | 3.1a | 7th  Use numerical methods to solve problems in context. |
| Change of sign and continuous function in the interval root | **A1** | 2.4 |
|  | **(2)** |  |  |
| **5b** | Makes an attempt to differentiate h(*t*) | **M1** | 2.2a | 7th  Use numerical methods to solve problems in context. |
| Correctly finds | **A1** | 1.1b |
| Findsand | **M1** | 1.1b |
| Attempts to find | **M1** | 1.1b |
| Finds | **A1** | 1.1b |
|  | **(5)** |  |  |
| **5c** | Demonstrates an understanding that *x* = 19.3705 and *x* = 19.3715 are the two values to be calculated. | **M1** | 2.2a | 7th  Use numerical methods to solve problems in context. |
| Findsand | **M1** | 1.1b |
| Change of sign and continuous function in the interval root | **A1** | 2.4 |
|  | **(3)** |  |  |
| (10 marks) | | | | |
| Notes  **5a**  Minimum required is that answer states there is a sign change in the interval and that this implies a root in the given interval. | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **6a** | States that the local maximum occurs when | **B1** | 3.1a | 7th  Use numerical methods to solve problems in context. |
| Makes an attempt to differentiate p(*t*) | **M1** | 2.2a |
| Correctly finds | **A1** | 1.1b |
| Finds  and | **M1** | 1.1b |
| Change of sign and continuous function in the interval  Therefore the gradient goes from positive to negative and so the function has reached a maximum. | **A1** | 2.4 |
|  | **(5)** |  |  |
| **6b** | States that the local minimum occurs when | **B1** | 3.1a | 7th  Use numerical methods to solve problems in context. |
| Makes an attempt to differentiate | **M1** | 2.2a |
| Correctly finds | **A1** | 1.1b |
| Findsand | **M1** | 1.1b |
| Attempts to find | **M1** | 1.1b |
| Finds | **A1** | 1.1b |
|  | **(6)** |  |  |
| (11 marks) | | | | |
| Notes  **6a**  Minimum required is that answer states there is a sign change in the interval and that this implies a root in the given interval. | | | | |