| **Question** | **Scheme** | **Marks** |
| --- | --- | --- |
| **1(a)** |  | M1A1**cso** |
|  \* | **(2)** |
| **1(b)** |  | M1A1 |
|  | M1 |
| So,  **\*** | A1\* **cso** |
|  |  | **(4)** |
| **1(c)** |  | M1 |
|  | A1 aef |
|  | M1A1**cso** |
|   | **dd**M1 A1 **cao and cso** |
|  |  | **(6)** |
| **1(d)** |  | M1A1ft |
|  | **Note parts (c) and (d) can be marked together.** | **(2)** |
|  |  | **(14 marks)** |
| **2(a)** |  | M1 A1 |
|  |  | **(2)** |
| **2(b)** |  | M1 A1 |
|  | A1 \* |
|  |  | **(3)** |
| **2(c)** |  | B1ft |
|  | M1 |
|  |  |
|  | A1 \* |
|  |  | **(3)** |
| **2(d)** |  | M1 A1 M1 |
|  | A1 |
|  | A1 |
|  |  | **(5)** |
| **2(e)** |  | M1 A1ft |
|  |  | **(2)** |
|  |  | **(15 marks)** |
| **3(a)** |  |  | B1 oe |
|  |  |
|  | Making *y* the subject of their expression and substitute this into the correct *L* formula. | M1 |
|  So,  **AG** | Correct solution only.  | A1 **cso** |
|  |  | **(3)** |
| **3(b)** |  | Either  or  | M1 |
|  | Correct differentiation (need not be simplified). | A1 aef |
|   |  and “their ”or “their ”  | M1; |
|  | or  | A1 **cso** |
|   | Substitute candidate’s value of *x*into a formula for *L*. | ddM1 |
|  | 54 | A1 **cao** |
|  |  | **(6)** |
| **3(c)** |  | Correct ft and considering sign.  | M1 |
|  |  and > 0 and conclusion. | A1 |
|  |  | **(2)** |
|  |  | **(11 marks)** |
| **4**  | ,  |  |  |
|    |  | M1 |
|  |  | A1 |
|   |  | M1 oe |
|  | or   |  |
| When  | **dependent on the previous M1** | dM1 |
|  | or  or  | A1 oe |
|  |   | **(5 marks)** |
| **5(a)** |   | M1 A1 |
|  |  | **(2)** |
| **5(b)** |   |  |
|  | M1 A1 |
|   |  |
|   | M1 |
|   | A1 |
|  |   | **(4)** |
| **5(c)** |  | M1 A1 |
|  |  |
| At *t*=10 |  |
|   | M1 A1 |
|  |  | **(4)** |
| **5(d)** | . Hence P cannot be 270 | B1 |
|  |  | **(1)** |
|  |  | **(11 marks)** |
| **6(a)** |   | B1 |
|  |  | **(1)** |
| **6(b)** |  | M1 |
|   | M1 A1 |
|  |  | **(3)** |
| **6(c)** |  At maximum   |  |
|  |  |
|  oe  | M1 |
|   | M1,A1 |
| Sub   | A1 |
|  |  | **(4)** |
| **6(d)** | 40 | B1 |
|  |  | **(1)** |
|  |  | **(9 marks)** |
| **7** |   | M1 A1 |
|  At   | M1 |
|   | M1 A1 |
|  |  | **(5 marks)** |
| **8(a)** |   🞸 cso | B1 |
|  |  | **(1)** |
| **8(b)** |    | M1 |
|  At *x* = 8,   | A1 |
|  |  | **(2)** |
| **8(c)** |   | B1 |
|   | M1 |
|  At *x* = 8  | A1 |
|  |  | **(3)** |
|  |  | **(6 marks)** |
| **9(a)** |   or equivalent | M1 A1 |
|  At ,    | M1 A1 |
|  |   | **(4)** |
| **9(b)** |   or  | M1 |
|  At ,  awrt 0.031 | A1 |
|  |  | **(2)** |
|  |  | **(6 marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | C2 2014 | 10 | 5.7 | Differentiation | 1.1b, 2.1, 2.2a, 2.4, 3.1b, 3.4 |
| 2 | C2 2016 | 9 | 5.1, 7.1, 7.2 and 7.3 | Trigonometry, Differentiation | 1.1b, 2.1, 2.2a, 2.4, 3.1b, 3.4 |
| 3 | C2 2011 | 8 | 7.1, 7.2 and 7.3 | Differentiation | 1.1b, 2.1 |
| 4 | C4 June 2014 | 4 | 7.4 | Differentiation | 1.1b, 3.1b |
| 5 | C3 June 2014 | 8 | 6.1, 6.2, 6.3, 6.7, 7.4 | Exponential growth, Differentiation of exponential function | 1.1b, 3.1a, 3.4, 3.5b |
| 6 | C3 2017 | 8 | 6.1, 6.2, 6.3, 6.5, 6.7, 7.4 | Real life exponential problem, quotient rule  | 1.1b, 2.1, 3.1a |
| 7 | C4 Jan 2011 | 2 | 7.2, 6.4 | Differentiation | 1.1b, 2.1 |
| 8 | C4 2012 | 2 | 7.4 | Differentiation | 1.1b, 3.1a |
| 9 | C4 2011 | 3 | 7.4 | Differentiation | 1.1b |