| **Question** | **Scheme** | **Marks** |
| --- | --- | --- |
| **1 (a)** |  |  |
|  |  |
|  | dM1 |
|  | A1 **cso** |
|  |  | **(5)** |
| **1 (b)** | At | M1 |
| **and either** **T**: |  |
| **or** , |  |
| **T**:  or | A1 **cso** |
|  |  | **(2)** |
|  |  | **(7 marks)** |
| **2(a)** |  |  |
|  |  |
| At | dM1 A1 **cso** |
|  |  | **(5)** |
| **2(b)** | So, m(**N**) = | M1 |
| **N**: | M1 |
| **N**: | A1 |
|  |  | **(3)** |
|  |  | **(8 marks)** |
| **3(a)** |  |  |
|  |  |
|  | dM1 |
|  | A1 **cso** |
|  |  | **(5)** |
| **3(b)** |  | M1 |
|  | A1ft |
|  | dM1 |
|  |  |
|  | A1  **cso** |
| When , |  |
| **and** **or**  **and** | ddM1 A1 |
|  |  | **(6)** |
|  |  | **(11 marks)** |
| **4(a)** |  |  |
|  |  |
|  | dM1 |
|  |  |
| Simplifying gives | A1 **cso** **oe** |
|  |  | **(5)** |
| **4(b)** |  | M1 |
| So , |  |
|  | M1 |
|  |  |
| gives  or | A1 oe |
|  | ddM1 |
|  | A1 **cao** |
|  |  | **(5)** |
|  |  | **(10 marks)** |
| **5(a)** |  |  |
|  | dM1 |
|  | A1 **cso** |
|  |  | **(5)** |
| **5(b)** | At | M1 |
|  | M1 |
|  | dM1 |
| Cuts *x*-axis |  |
| So, | A1 o.e. |
|  |  | **(4)** |
|  |  | **(9 marks)** |
| **6(a)** |  |  |
|  |  |
|  | dM1 |
|  |  |
| or  or  or  or exact equivalent | A1 **cso** |
|  |  | **(6)** |
| **6(b)** | e.g. or | M1 |
| Cuts *y*-axis | M1 |
|  |  |
|  |  |
|  |  |
|  | A1 **cso isw** |
|  |  | **(3)** |
|  |  | **(9 marks)** |
| **7(a)** | Differentiating implicitly to obtain  and/or | M1 |
|  | A1 |
| or equivalent | B1 |
|  | M1 |
|  | A1 |
|  |  | **(5)** |
| **7(b)** |  | M1 |
| Using  or |  |
| or | M1 |
| Leading to |  |
|  |  |
| or | M1 |
| or |  |
| or | A1 A1 |
|  |  |
| Substituting either of their values into  to obtain a value of the  other variable. | M1 |
| both | A1 |
|  |  | **(7)** |
|  |  | **(9 marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | C4 June 2014 | 1 | 7.5, 7.3 | Implicit differentiation | 1.1b |
| 2 | C4 Jan 2012 | 1 | 7.3, 7.5 | Implicit differentiation | 1.1b |
| 3 | C4 2015 | 2 | 7.5, | Implicit differentiation | 1.1b,3.1a |
| 4 | C4 June 2014R | 3 | 7.5, 2.4 | Implicit differentiation | 1.1b, 3.1a |
| 5 | C4 2016 | 3 | 7.2, 7.3, 7.4, 7.5 | Implicit differentiation | 1.1b, 2.1, 3.1a |
| 6 | C4 2017 | 4 | 6.4, 7.2, 7.3, 7.5 | Implicit differentiation | 1.1b, 2.1, 3.1a |
| 7 | C4 2012 | 5 | 7.5 | Implicit differentiation | 1.1b |