| **Question** | **Scheme** | | | | | **Marks** |
| --- | --- | --- | --- | --- | --- | --- |
| **1(a)** | for any constant *B* | | | | | M1 |
| Applying *vu*′ + *uv′* | | | | | M1 A1 A1 |
|  |  | | | | | **(4)** |
| **1(b)** | Applying | | | | | M1 A1+A1  A1 |
|  | | | | | A1 |
|  |  | | | | | **(5)** |
|  |  | | | | | **(9 marks)** |
| **2(a)** |  | | | | | M1 A1 |
|  |  | | | | | **(2)** |
| **2(b)** | Applying | | | | | M1 |
|  | oe | | | | | A2, 1, 0 |
|  |  | | | | | **(3)** |
|  |  | | | | | **(5 marks)** |
| **3(a)** |  | | | | |  |
|  | | | An attempts to form a single fraction | | M1 |
|  | | | Simplifies to give a correct quadratic numerator over a correct quadratic denominator | | A1 aef |
|  | | | An attempt to factorise a 3 term quadratic numerator | | M1 |
|  | | |  | | A1 |
|  |  | | | | | **(5)** |
| **3(b)** | f(*x*) = , *x* > 1 | | | | |  |
| f(*x*) = | | | | |  |
|  | | | An attempt to form a single fraction | | M1 |
|  | | | | |  |
|  | | | Correct result | | A1 \* |
|  |  | | | | | **(2)** |
| **3(c)** | f(*x*) =  = 3(2*x* – 1)–1 | | | | |  |
| = 3(–1) (2*x* – 1)–2 (2) | | | | |  |
| ± *k* (2*x* – 1)–2 | | | | | M1 |
|  | | | | | A1 aef |
|  | | | Either  or | | A1 |
|  |  | | | | | **(3)** |
|  |  | | | | | **(9 amrks)** |
| **4(a)** |  | | | | | M1A1 |
|  |  | | | | | **(2)** |
| **4(b)** | Uses to obtain | | | | | M1 |
|  | | | | | B1 |
| Uses  and  to get or in just *x*. | | | | | M1 |
| CSO | | | | | A1\* |
|  |  | | | | | **(4)** |
| **4(c)** |  | | | | | M1A1 |
|  | | | | | dM1A1 |
|  |  | | | | | **(4)** |
|  |  | | | | | **(10 marks)** |
| **5(a)** |  | | | | | M1A1 |
|  | | | | | M1 |
|  | | | | | A1 |
|  | | | | | M1A1 |
|  |  | | | | | **(6)** |
| **5(b)** | At *x* = 0 | | | | | B1 |
| Equation of normal is  or any equivalent | | | | | M1A1 |
|  |  | | | | | **(3)** |
|  |  | | | | | **(9 marks)** |
| **6** | … | | | | | B1 |
| … | | | | | M1 A1 |
| At , | | | | | M1 |
| leading to  Accept | | | | | A1 |
|  | | | | |  |
| At | | | | | M1 |
|  | | | | | A1 |
|  |  | | | | | **(7 marks)** |
| **7(i)(a)** |  | | | | | M1A1A1 |
|  | | | | |
|  |  | | | | | **(3)** |
| **7(i)(b)** |  | | | | | B1M1A1 |
|  |  | | | | | **(3)** |
| **7(ii)** |  | | | | | M1 A1 |
|  | | | | | M1 |
| Uses and  in or to get an expression in *x* | | | | |  |
| cso | | | | | M1 A1\* |
|  |  | | | | | **(5)** |
|  |  | | | | | **(11 marks)** |
| **8(a)(i)** |  | | | | | M1 |
|  | | | | | M1A1 |
|  |  | | | | | **(3)** |
| **8(a)(ii)** |  | | | | | M1A1 |
|  | | | | | A1 |
|  |  | | | | | **(3)** |
| **8(b)** |  | | | | | M1A1 |
|  | | | | | M1 |
| and | | | | | M1A1 |
|  |  | | | | | **(5)** |
|  |  | | | | | **(11 marks)** |
| **9(a)** |  | | | | | M1A1 |
|  | | | | | M1 |
|  | | | | | A1\* |
|  |  | | | | | **(4)** |
| **9(b)** |  | | | | | M1 A1 |
| cso | | | | | A1 |
|  |  | | | | | **(3)** |
| **9(c)** | Maximum occurs when | | | | | M1 |
|  | | | | | A1 |
| When | | | | | M1 A1 |
| Range of h(*x*) is | | | | | A1ft |
|  |  | | | | | **(5)** |
|  |  | | | | | **(12 marks)** |
| **10(a)** |  | | | | |  |
| Apply quotient rule: | | | | |  |
|  | | | Applying | | M1 |
|  | | | Any one term correct on the numerator | | A1 |
|  | | | Fully correct (unsimplified). | | A1 |
|  | | | | |  |
|  | | | For correct proof with an understanding that  No errors seen in working. | |  |
| (as required) | | | | | A1\* |
|  |  | | | | | **(4)** |
| **10(b)** | When , | | | |  | B1 |
| At | | | |  | B1 |
| Either **T**:  or  and  ; | with ‘their TANGENT gradient’ and their *y*1;  or uses  with ‘their TANGENT gradient’; | | | | M1 |
| **T:** | | |  | | A1 |
|  |  | | | | | **(4)** |
|  |  | | | | | **(8 marks)** |
| **11(a)** |  | | | | |  |
|  | | Writes  as  and gives | | | M1 |
| or | | | A1 |
|  | | | Convincing proof.  Must see both | | A1 **AG** |
|  |  | | |  | | **(3)** |
| **11(b)** |  | | |  | |  |
|  | | |  | | M1 |
|  | | A1 |
|  |  | | |  | | **(2)** |
| **11(c)** |  | | | Applies | | M1 |
|  | | | Substitutes  for | | M1 |
|  | | | Attempts to use the identity | | M1 |
| So | | |  | |  |
|  | | |  | | A1 |
|  |  | | |  | | **(4)** |
|  |  | | | | | **(9 marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | C3 Jan 2012 | 1 | 7.2, 7.4 | Differentiation | 1.1b |
| 2 | C3 2011 | 1 | 7.4 | Differentiation | 1.1b, 3.1a, 3.2a |
| 3 | C3 Jan 2011 | 2 | 2.6, 7.4 | Partial fractions, Differentiation | 1.1b, 2.1 |
| 4 | C3 2013 | 5 | 7.2, 7.4, 5.4, 5.5 | Differentiation and trigonometry | 1.1b, 2.1, 3.1a |
| 5 | C3 2012 | 3 | 7.2, 7.3, 7.4, 5.7 | Trigonometry, Differentiation | 1.1b, 3.1a |
| 6 | C4 2011 | 5 | 7.5 | Differentiation | 1.1b, 3.1a, 3.4 |
| 7 | C3 Jan 2013 | 5 | 7,1, 7.4, 5.5 | Differentiation | 1.1b, 2.1, 2.2a, 2.4, 3.1a, 3.4 |
| 8 | C3 2012 | 7 | 7.2, 7.4, 5.5 | Trigonometry, Differentiation | 1.1b, 3.1a |
| 9 | C3 Jan 2013 | 7 | 2.6, 2.8, 7.3, 7.4 | Algebra and functions, Differentiation | 1.1b, 3.1a |
| 10 | C3 Jan 2011 | 7 | 7.3, 7.4, 5.5 | Differentiation | 1.1b |
| 11 | C3 Jan 2011 | 8 | 7.4, 5.4, 5.5 | Differentiation, Trigonometry | 1.1b, 2.1, 2.2a |