**MATHEMATICS METHODS**

**MAWA Semester 1 (Unit 3) Examination 2019**

**Calculator-free**

# Marking Key

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**The release date for this exam and marking scheme is 14th June.**

**Section One: Calculator-free (50 Marks)**

**Question 1(a) (2 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Mark |
| * applies product rule
* differentiates exponential correctly
 | 11 |

**Question 1(b) (3 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * applies quotient rule
* differentiates  correctly
* simplifies result
 | 111 |

**Question 1(c) (3 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * states
* states
* states  in terms of
 | 111 |

**Question 1(d) (3 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * differentiates to obtain
* equates
* determines  value
 | 111 |

**Question 2 (a) (4 marks)**

|  |
| --- |
| Solution |
| (i)(ii)(iii)(iv) |
| Mathematical behaviours | Mark |
| (i) * states D and F

(ii)* states C

(iii)* states E

(iv)* states A and G
 | 1111 |

**Question 2(b) (1 mark)**

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Marks |
| * circles the 2nd graph
 | 1 |

**Question 3 (4 marks)**

|  |
| --- |
| Solution |
|  Area =  =   =  =  =  =  |
| Mathematical behaviours | Marks |
| * states a correct expression using integrals to determine the area
* anti-differentiates each part correctly
* substitutes in limits of integration
* evaluates result
 | 1111 |

**Question 4(a) (2 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * anti-differentiates the exponential function correctly
* anti-differentiates the square root function correctly
 | 11 |

**Question 4(b) (2 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * aniti-differentiates correctly
* substitutes limits of integration and evaluates
 | 11 |

**Question 4(c) (2 marks)**

|  |
| --- |
| Solution |
|   =  |
| Mathematical behaviours | Marks |
| * uses the relationship  =
* applies Fundamental Theorem of Calculus
 | 11 |

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Marks |
| * anti-differentiates integral correctly
* substitutes in limits of integration correctly and simplifies to obtain correct

 expression on the LHS* determines correct answers for
 | 111 |

**Question 4(d) (3 marks)**

**Question 5(a) (3 marks)**

|  |
| --- |
| Solution |
| Bernoulli distribution with   |
| Mathematical behaviours | Marks |
| * states Bernoulli
* states mean
* states variance
 | 111 |

**Question 5(b) (3 marks)**

|  |
| --- |
| Solution |
| This represents a Binomial with  and   |
| Mathematical behaviours | Marks |
| * states Binomial
* states
* states
 | 111 |

**Question 5(c) (1 mark)**

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Marks |
| * states correct expression
 | 1 |

**Question 5(d) (3 marks)**

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Marks |
| * recognises the situation involves a binomial and conditional

 probability * states correct expression for numerator
* states correct expression for denominator
 | 1 11 |

**Question 6(a) (1 mark)**

|  |
| --- |
| Solution |
| (i) Under-estimated Area =  = (ii) Over-estimated Area =  =  =  |
| Mathematical behaviours | Marks |
| (i)* states the sum of the area of the two rectangles and simplifies correctly

(ii)* states the sum of the area of the three rectangles and simplifies correctly
 | 11 |

**Question 6(b) (2 marks)**

|  |
| --- |
| Solution |
| Using trapeziums is equivalent to averaging the results from part (a)i.e. Estimated area under from  to is  =  =  =  |
| Mathematical behaviours | Marks |
| * determines the average of the two areas obtained in part (a)
* simplifies to deduce the required result
 | 11 |

**Question 7(a) (1 mark)**

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Mark |
| * States correct answer
 | 1 |

**Question 7(b) (3 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * integrates both sides of equation
* applies fundamental theorem
* rearranges to get required result
 | 111 |

**Question 7(c) (3 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * recognises  term is to be involved
* states correct integral and bounds of integration
* substitutes bounds of integration and simplifies
 | 111 |