**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 | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * applies quotient rule * differentiates  correctly * simplifies result | 1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * states * states * states  in terms of | 1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * differentiates to obtain * equates * determines  value | 1  1  1 |

**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 | 1  1  1  1 |

**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 | 1  1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * anti-differentiates the exponential function correctly * anti-differentiates the square root function correctly | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * aniti-differentiates correctly * substitutes limits of integration and evaluates | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| = | |
| Mathematical behaviours | Marks |
| * uses the relationship  = * applies Fundamental Theorem of Calculus | 1  1 |

|  |  |
| --- | --- |
| 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 | 1  1  1 |

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

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

|  |  |
| --- | --- |
| Solution | |
| Bernoulli distribution with | |
| Mathematical behaviours | Marks |
| * states Bernoulli * states mean * states variance | 1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| This represents a Binomial with  and | |
| Mathematical behaviours | Marks |
| * states Binomial * states * states | 1  1  1 |

**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    1  1 |

**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 | 1  1 |

**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 | 1  1 |

**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 | 1  1  1 |

**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 | 1  1  1 |