**MATHEMATICS METHODS**

**MAWA Semester 2 (Unit 3&4) Examination 2019**

**Calculator-free**

# Marking Key

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The release date for this exam and marking scheme is

* **the end of week 1 of term 4, Fri October 18th 2019**

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

**Question 1 (a) (3 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * uses product rule correctly * differentiates correctly * differentiates correctly | 1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| Let (\*)  Then and so  (\*\*)  Since | |
| Mathematical behaviours | Marks |
| * makes substitution (\*) * integrates correctly (\*\*)   (use of rule  to integrate correctly – award both marks)   * evaluates integration constant correctly | 1  1  1 |

**Question 2 (3 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * uses the formula for margin of error to compare each sample * simplifies equation by squaring and dividing * re-arranges equation to determine the value of k | 1  1  1 |

**Question 3(a) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
| |  |  |  |  | | --- | --- | --- | --- | |  |  |  | a | |  |  |  |  | | |
| Mathematical behaviours | Marks |
| * uses log laws to find probability, P(2). * uses log laws to find probability, P(3). | 1  1 |

**Question 3(b) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * sums probabilities and equates to 1 * rearranges formula to express  in terms of | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * determines value of * substitutes into the expected value formula * states expected value | 1  1  1 |

**Question 4(a) (3 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * rewrites equation by taking logarithms of each side and applying log laws * rearranges equation to isolate * solves for | 1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * uses  laws to simplify both sides of equation * obtains quadratic equation * simplifies quadratic and solves * solves for  justifying answer | 1  1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * anti-differentiates to obtainexpression * substitutes exact values and evaluates expression * uses  laws to simplify expression * states the value of  and | 1  1  1  1 |

**Question 5 (4 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * uses Fundamental Theorem of Calculus * uses chain rule to differentiate * determines * determines and shows how to calculate the constant, c. | 1  1  1  1 |

**Question 6(a) (3 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * determines the acceleration equation * anti-differentiates to find the velocity equation * states the correct velocity at 5 seconds | 1  1  1 |

**Question 6(b) (3 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * anti-differentiates velocity equation to find displacement equation * substitutes for t = 5 seconds * gives correct distance travelled | 1  1  1 |

**Question 7 (3 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * anti-differentiates exponential function * substitutes correctly * simplifies correctly | 1  1  1 |

**Question 8 (4 marks)**

|  |  |
| --- | --- |
| Solution | |
| and so  By the increments formula, (\*)  So (\*\*)  Now  So  So the percentage change in the radius is a decreases of 0.5 %. | |
| Mathematical behaviours | Marks |
| * differentiates correctly * finds approximation (\*) * evaluates * obtains correct answer | 1  1  1  1 |

**Question 9(a) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
| So *k* (y-intercept) =  Gradient =  for 0 ≤ *t* ≤ 6 | |
| Mathematical behaviours | Marks |
| * determines k value * states the probability density function | 1  1 |

**Question 9(b) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
| i.e. F(t) = | |
| Mathematical behaviours | Marks |
| * integrates f(t) * states the cumulative distribution function | 1  1 |

**Question 9(c) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * determines the intersection of probabilities for t > 1 and t < 3 * calculates the conditional probability | 1  1 |