**MATHEMATICS METHODS**

**MAWA Semester 1 (Unit 3) Examination 2020**

**Calculator-free**

# Marking Key

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The release date for this exam and marking scheme is

* **June 12th the end of week 7 of term 2, 2020**

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

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

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Mark |
| * applies chain rule
* obtains correct result
 | 11 |

**Question 1(b) (2 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * differentiates cos term correctly
* applies product rule and states result
 | 11 |

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

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * differentiates correctly
* substitutes and simplifies to (\*)
* evaluates correctly, stating Pythagorean identity
 | 111 |

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

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * equates function to 0 and obtains
* states $ $
 | 11 |

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

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Marks |
| * differentiates, equates to 0 and solves
* obtains correct $y$ values of the stationary points
* uses second derivative test (or sign test) to determine nature of stationary

 points* locates point of inflection
 | 1111 |

**Question 2(c) (1 mark)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * determines and concludes maximum
 | 1 |

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Marks |
| * plots zeros at 0 and such that
* plots stationary points and point of inflection accurately
* obtains correct shape for the graph, scale and end points
 | 111 |

 **Question 2(d) (3 marks)**

**Question 3(a) (1 mark)**

|  |
| --- |
| Solution |
| , |
| Mathematical behaviours | Mark |
| * states correct answer
 | 1 |

**Question 3(b) (4 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * states the change as
* anti-differentiates correctly
* substitutes correct limits of integration
* determines correct answer
 | 1111 |

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

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * states the sum of probabilities is 1
* deduces *k* value
 | 11 |

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

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * states an expression to calculate required probability
* determines probability
 | 11 |

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

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * writes fraction with the correct denominator
* obtains simplified result
 | 11 |

**Question 5(a) (4 marks)**

|  |
| --- |
| Solution |
| (i) (ii) |
| Mathematical behaviours | Marks |
| (i)* states anti-derivative
* evaluates result

(ii)* rewrites fraction as sum of two functions
* anit-differentiates including
 | 1111 |

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

|  |
| --- |
| Solution |
| (i)(ii) |
| Mathematical behaviours | Marks |
| (i)* applies linearity of integrals, swaps bounds of integration and determines the correct result

(ii)* applies linearity of integrals correctly
* integrates correctly and calculates the result
 | 111 |

**Question 5(c) (5 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * applies the chain rule to the derivative
* differentiates correctly
* recognises application of the Fundamental Theorem
* factors out and re-writes fraction involving in numerator and denominator as one fraction squared
* multiplies both sides of expression by to obtain desired result
 | 11111 |

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

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * applies quotient rule
* differentiates both parts correctly and states the value of *c* and *d*
* simplifies result and states value of *a* and *b*
 | 111 |

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

|  |
| --- |
| Solution |
| So the coordinates of B are  |
| Mathematical behaviours | Marks |
| * equates derivative to 0 and solves
* states co-ordinates of B
 | 11 |

|  |
| --- |
| Solution |
|  It is the area between the two curves from *x* = 0 to *x* = π. |
| Mathematical behaviours | Marks |
| * states it is the area between the two given curves
* states the area is from  to
 | 1 1 |

**Question 7(a) (2 marks)**

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

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Marks |
| * anti-differentiates  correctly
* anti-differentiates correctly
* includes constant of integration
 | 111 |