**MATHEMATICS METHODS**

**MAWA Semester 1 (Unit 3) Examination 2017**

**Calculator-free**

# Marking Key

© MAWA, 2017

**Licence Agreement**

This examination is Copyright but may be freely used within the school that purchases this licence.

* The items that are contained in this examination are to be used solely in the school for which they are purchased.
* They are not to be shared in any manner with a school which has not purchased their own licence.
* The items and the solutions/marking keys are to be kept confidentially and not copied or made available to anyone who is not a teacher at the school. Teachers may give feedback to students in the form of showing them how the work is marked but students are not to retain a copy of the paper or marking guide until the agreed release date stipulated in the purchasing agreement/licence.

The release date for this exam and marking scheme is

* **the end of week 8 of term 2, 2017**

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

**1(a)(i) (2 marks)**

|  |  |
| --- | --- |
| Solution |  |
| Marking key/mathematical behaviours | Marks |
| * correctly differentiates using chain rule * recognises as | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| Marking key/mathematical behaviours | Marks |
| * correctly differentiates using quotient rule * correctly determines derivative of denominator | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| Marking key/mathematical behaviours | Marks |
| * correctly differentiates * correctly differentiates using chain rule * correctly evaluates | 1  1  1 |

**Question 2 (6 marks)**

|  |  |
| --- | --- |
| Solution  when i.e. when  In the interval has just one stationary point, which occurs when  If then and (3-4-5 right triangle), so  If , and if  So the minimum value of is indeed | |
| Marking key/mathematical behaviours | Marks |
| * differentiates correctly * identifies the single stationary point * evaluates at the stationary point * checks values of at the end points * gives correct answer | 1+1  1  1  1  1 |

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

|  |  |
| --- | --- |
| Solution    (smallest positive solution)  So first at rest after seconds |  |
| Marking key/mathematical behaviours | Marks |
| * obtains * gives correct answer | 1  1 |

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

|  |  |
| --- | --- |
| Solution  when  So the initial acceleration is zero. | |
| Marking key/mathematical behaviours | Marks |
| * differentiates correctly * obtains correct answer | 1  1 |

**Question 3(c) (2marks)**

|  |  |
| --- | --- |
| Solution  Since for all the particle never moves ‘backwards’.  So it never returns to its starting point. | |
| Marking key/mathematical behaviours | Marks |
| * correct answer * valid reason | 1  1 |

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

|  |  |
| --- | --- |
| Solution  Since the particle never moves backwards, the distance travelled is m. | |
| Marking key/mathematical behaviours | Marks |
| * obtains distance travelled as the integral of * evaluates integral correctly | 1  1 |

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

|  |  |
| --- | --- |
| Solution  The shaded area = area of the square – area of the quarter circle – area of the triangle    Hence the probability, of a dart landing within the shaded area is, |  |
| Marking key/mathematical behaviours | Marks |
| * States how the shaded area may be calculated (line 1 of solution) * Calculates at least one of the areas of the required regions * Determines the shaded area in terms of * States the probability as a ratio of the total area * Simplifies to the required result | 1  1  1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| Marking key/mathematical behaviours | Marks |
| * Uses the result from part (a) to determine * Applies the multiplication principle correctly | 1  1 |

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

|  |  |
| --- | --- |
| Solution  Probability Jamie hits the green region only once in three throws | |
| Marking key/mathematical behaviours | Marks |
| * States the three ways that this can happen * Applies the addition principle and determines the correct result | 1  1 |

**Question 4(d) (2 marks)**

|  |  |
| --- | --- |
| Solution  Probability Jamie hits the green region at least once in three throws | |
| Marking key/mathematical behaviours | Marks |
| * Recognises the compliment * States the correct result | 1  1 |

**Question 5(a)** **(2 marks)**

|  |  |
| --- | --- |
| Solution  = | |
| Marking key/mathematical behaviours | Marks |
| * correctly integrates each term * correctly adds constant of integration (1 mark penalty once only throughout the rest of question 5) | 1  1 |

**Question 5(b) (2 marks)**

|  |  |
| --- | --- |
| Solution  =  = + c | |
| Marking key/mathematical behaviours | Marks |
| * correctly simplifies integral * correctly integrates each term | 1  1 |

**Question 5(c) (2 marks)**

|  |  |
| --- | --- |
| Solution  =  = | |
| Marking key/mathematical behaviours | Marks |
| * recognises the rule * correctly integrates | 1  1 |

**Question 5(d) (2 marks)**

|  |  |
| --- | --- |
| Solution  = | |
| Marking key/mathematical behaviours | Marks |
| * correctly integrates first term * correctly integrates second term | 1  1 |

**Question 6 (4 marks)**

|  |  |
| --- | --- |
| Solution    =  = | |
| Marking key/mathematical behaviours | Marks |
| * correctly manipulates the expansion to express in terms of cos(2x) * correctly integrates each part | 2  2 |

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

|  |  |
| --- | --- |
| Solution  =  =  =  = -1 | |
| Marking key/mathematical behaviours | Marks |
| * correctly integrates * correctly evaluates | 1  1 |

**Question 7(b) (2 marks)**

|  |  |
| --- | --- |
| Solution  =  = | |
| Marking key/mathematical behaviours | Marks |
| * indicates the change of limits * correctly applies fundamental theorem | 1  1 |

**Question 7(c)** **(2 marks)**

|  |  |
| --- | --- |
| Solution  =  =  =  = | |
| Marking key/mathematical behaviours | Marks |
| * correctly integrates * correctly evaluates | 1  1 |