**MATHEMATICS METHODS**

**MAWA Semester 1 (Unit 3) Examination 2018**

**Calculator-free**

# Marking Key

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The release date for this exam and marking scheme is

* **the end of week 8 of term 2, 2018**

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

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

|  |  |
| --- | --- |
| Solution | |
| . | |
| Mathematical behaviours | Marks |
| * applies product rule * differentiates  term | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * applies the chain rule * differentiates *sin x* term | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * applies chain rule to obtain * applies quotient rule * correct answer | 1  1  1 |

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * states a correct expression using integrals to determine the area * anti-differentiates integral correctly * subs in limits of integration correctly * determines correct result | 1  1  1  1 |

**Question 2 (4 marks)**

**Question 3 (3 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * anti-differentiates square root term * uses anti-derivative and  to determine * states | 1  1  1 |

**Question 4 (a) (1 mark)**

|  |  |
| --- | --- |
| Solution | |
| has a discrete uniform distribution | |
| Mathematical behaviours | Marks |
| * states that the distribution is uniform | 1 |

**Question 4 (b) (1 mark)**

|  |  |
| --- | --- |
| Solution | |
| There are whole numbers in the interval  So | |
| Mathematical behaviours | Marks |
| * correct answer | 1 |

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

|  |  |
| --- | --- |
| Solution | |
| There are and so there are whole numbers in the interval that are divisible by  So . | |
| Mathematical behaviours | Marks |
| * obtains 142 whole numbers divisible by 7 * divides by 1000 | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| In the interval there are:  whole numbers that are divisible by whole numbers that are divisible by and whole numbers that are divisible by both (i.e. divisible by  So there are whole numbers that are divisible by .  and so . | |
| Mathematical behaviours | Marks |
| * correct numbers for divisibility by 10 and by 25 * uses * divides by 1000 | 1+1  1  1 |

**Question 4 (e) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
| The following numbers have exactly two 3’s in their decimal expansion:  , , and  So . | |
| Mathematical behaviours | Marks |
| * obtains 27 whole numbers with the desired property * divides by 1000 | 1  1 |

**Question 5 (3 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * correctly identifies stationary points * correctly identifies point of inflection * accurate sketch of the curve including *x* axis intercepts | 1  1  1 |

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * splits the fraction into two parts and anti-differentiates * states anti-derivative including +*c* | 1  1 |

**Question 6 (a) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * anti-differentiates sin or cos part of expression correctly * states correct solution | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * expands brackets correctly * anti-differentiates each part correctly | 1  1 |

**Question 6 (c) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * correctly differentiates * applies chain rule * correct answer | 1  1  1 |

**Question 7 (a) (3 marks)**

**Question 7 (b) (4 marks)**

|  |  |
| --- | --- |
| Solution | |
| , when | |
| Mathematical behaviours | Marks |
| * correct substitution and subtraction of fractions * both exact values correct * correct simplified answer | 1+1  1  1 |

**Question 8 (a) (i) (1 mark)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * determines expression | 1 |

**Question 8 (a) (ii) (3 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * uses linearity to deduce * uses relationship * sums expressions and simplifies | 1  1  1 |

**Question 8 (b) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * applies the Fundamental Theorem * evaluates result | 1  1 |

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * states *m* = 0 or *m* = 3 * states all correct values for *m* | 1  1 |

**Question 8 (c) (i) (2 marks)**

**Question 8 (c) (ii) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * uses linearity to split * evaluates sum of integrals | 1  1 |