**MATHEMATICS METHODS**

**MAWA Semester 2 (Unit 3&4) Examination 2018**

**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 12th 2018**

**Section One: Calculator-free (54 Marks)**

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

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Marks |
| * integrates square root function correctly
* substitutes limits into correct anti-derivative
* evaluates result
 | 111 |

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

|  |
| --- |
| Solution |
|    |
| Mathematical behaviours | Marks |
| * anti-differentiates correctly
* substitutes in  to determine c
 | 11 |

**Question 1 (c) (2 marks)**

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Marks |
| * applies the fundamental theorem
* evaluates result
 | 11 |

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

|  |
| --- |
| Solution |
|    |
| Mathematical behaviours | Marks |
| * states that 63% represents 2 std deviations above the mean
* determines number of students above Joanne
 | 11 |

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

|  |
| --- |
| Solution |
|    |
| Mathematical behaviours | Marks |
| * diagram demonstrates that both distributions are normally distributed and

  * diagram clearly depicts
 | 11 |

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

|  |
| --- |
| Solution |
|    |
| Mathematical behaviours | Marks |
| * uses standard deviations to determine *a*
* states equation needed to solve for *b*
* determines *b* value
 | 111 |

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

|  |
| --- |
| Solution |
|

|  |  |  |
| --- | --- | --- |
| *X* | 5 | (-3) |
| P(*X=x*) |  |  |

  . |
| Mathematical behaviours | Marks |
| * correct entries for *X* values
* determines probabilities correctly
 | 11 |

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

|  |
| --- |
| Solution |
| *E*(*X*) =  =  = (-1)On average, Michael will lose $1 per toss |
| Mathematical behaviours | Marks |
| * determines expected gain correctly
* explains meaning of the negative value
 | 11 |

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

|  |
| --- |
| Solution |
| With a loss of $1 per toss, this is not a “fair” game.A game is considered “fair” if Michael will, on the average, come out even.That is, an expected gain of zero will define a “fair” game. |
| Mathematical behaviours | Marks |
| * states game is “not fair”
* valid explanation
 | 11 |

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

|  |
| --- |
| Solution |
| .  |
| Mathematical behaviours | Marks |
| * rearranges equation and writes in exponential form
* applies log laws to each term of equation
* rearranges equation to arrive at result
 | 111 |

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

|  |
| --- |
| Solution |
|  . |
| Mathematical behaviours | Marks |
| * uses and
* expresses , hence value of (-3)
* evaluates expression
 | 111 |

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

|  |
| --- |
| Solution |
|  =  =  |
| Mathematical behaviours | Marks |
| * expresses as
* uses
* applies chain rule correctly and simplifies
 | 111 |

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

|  |
| --- |
| Solution |
|  ==== or -  |
| Mathematical behaviours | Marks |
| * states anti-derivative of function with bounds
* substitutes in limits of integration correctly using
* evaluates result
 | 111 |

**Question 5 (c) (4 marks)**

|  |
| --- |
| Solution |
|    |
| Mathematical behaviours | Marks |
| * states correct derivative
* integrates both sides
* applies Fundamental Theorem
* rearranges to arrive at correct result
 | 1111 |

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

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Marks |
| * identifies that each toss must result in a head
* determines probability
 | 11 |

**Question 6(b) (4 marks)**

|  |
| --- |
| Solution |
|   |
| Mathematical behaviours | Marks |
| * identifies that will be normally distributed
* determines mean and standard deviation for distribution of
* determines Z score associated with
* determines probability
 | 1111 |

**Question 6 (c) (3 marks)**

|  |
| --- |
| Solution |
|  (\*) (\*\*)  |
| Mathematical behaviours | Marks |
| * determines values
* states calculation required to determine probability
* evaluates required sum
 | 111 |

**Question 7 (a) (4 marks)**

|  |
| --- |
| Solution |
|    or  , so has stationary points at and at

|  |  |  |  |
| --- | --- | --- | --- |
| *x* | 3- | 3 | 3+ |
|  | +ve | 0 | -ve |

Since if and if  has a point of inflection at and has a local maximum at  |
| Mathematical behaviours | Marks |
| * differentiates correctly
* equates  and determines co-ordinates of stationary points
* justifies nature of first stationary point
* justifies nature of 2nd stationary point
 | 1111 |

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

|  |
| --- |
| Solution |
| Yes.Reason: since  |
| Mathematical behaviours | Marks |
| * gives correct answer
* gives a valid reason
 | 11 |

**Question 7 (c) (3 marks)**

|  |
| --- |
| Solution |
|  |
| Mathematical behaviours | Marks |
| * shows inflection point at origin
* shows maximum at
* shows correct limits as and
 | 111 |