**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 | 1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * anti-differentiates correctly * substitutes in  to determine c | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * applies the fundamental theorem * evaluates result | 1  1 |

**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 | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * diagram demonstrates that both distributions are normally distributed and      * diagram clearly depicts | 1  1 |

**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 | 1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| |  |  |  | | --- | --- | --- | | *X* | 5 | (-3) | | P(*X=x*) |  |  |     . | |
| Mathematical behaviours | Marks |
| * correct entries for *X* values * determines probabilities correctly | 1  1 |

**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 | 1  1 |

**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 | 1  1 |

**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 | 1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| . | |
| Mathematical behaviours | Marks |
| * uses and * expresses , hence value of (-3) * evaluates expression | 1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| =  = | |
| Mathematical behaviours | Marks |
| * expresses as * uses * applies chain rule correctly and simplifies | 1  1  1 |

**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 | 1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * states correct derivative * integrates both sides * applies Fundamental Theorem * rearranges to arrive at correct result | 1  1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * identifies that each toss must result in a head * determines probability | 1  1 |

**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 | 1  1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| (\*)  (\*\*) | |
| Mathematical behaviours | Marks |
| * determines values * states calculation required to determine probability * evaluates required sum | 1  1  1 |

**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 | 1  1  1  1 |

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

|  |  |
| --- | --- |
| Solution | |
| Yes.  Reason: since | |
| Mathematical behaviours | Marks |
| * gives correct answer * gives a valid reason | 1  1 |

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

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * shows inflection point at origin * shows maximum at * shows correct limits as and | 1  1  1 |