**MATHEMATICS SPECIALIST**

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

**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, 2017**

**Section One: Calculator-free (52 Marks)**

**Question 1(a)**

|  |
| --- |
| Solution,  and  (i) (ii) (iii)  |
| Marking key/mathematical behaviours | Marks |
| (i)* Determines

(ii)* Determines and multiplies
* Expresses the result in the form

(iii)* Indicates the need to multiply by
* Multiplies this correctly
* Re-arranges in the form
 | 111111 |

**Question 1(a)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * Correctly plots
* Calculates
* Correctly plots
 | 111 |

**Question 2(a)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * substitutes the correct exact values into cis
* simplifies correctly
 | 11 |

**Question 2(b)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * applies de Moivre’s theorem
* substitutes exact values
* simplifies
 | 111 |

**Question 2(c)**

|  |
| --- |
| Solution and   |
| Marking key/mathematical behaviours | Marks |
| * Correctly states inequation for half plane above the line
* Correctly states the inequality of the circular region
* Indicates that it is the intersection of the two regions (ie uses “and”)
* Indicates the boundaries correctly by using the appropriate symbol within each inequation
 | 1111 |

**Question 3(a)**

|  |
| --- |
| Solution  |
| Marking key/mathematical behaviours | Marks |
| * determines expression
* states domain
* states range
 | 111 |

**Question 3(b)**

|  |
| --- |
| Solution  |
| Marking key/mathematical behaviours | Marks |
| * determines expression
* states domain
* states range
 | 111 |

**Question 3(c)**

|  |
| --- |
| Solution  |
| Marking key/mathematical behaviours | Marks |
| * rewrites function in turning point form
* states range
 | 11 |

**Question 3(d)**

|  |
| --- |
| Solution Restricted domain: |
| Marking key/mathematical behaviours | Marks |
| * restricts domain correctly
* swaps  and
* solves for
* determines the correct inverse rule
 | 1111 |

**Question 4**

|  |
| --- |
| Solution  are asymptotes:    |
| Marking key/mathematical behaviours | Marks |
| * states values of c and d
* states value of b
* states value of a
 | 111 |

**Question 5(a)**

|  |
| --- |
| Solution  |
| Marking key/mathematical behaviours | Marks |
| * sketches for
* sketches for
 | 11 |

**Question 5(b)**

|  |
| --- |
| Solution  |
| Marking key/mathematical behaviours | Marks |
| * sketches for
* sketches for
 | 11 |

**Question 5(c)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * shows two asymptotes
* shows  intercept (=0.2)
* sketches correctly (shape and accuracy)
 | 111+1 |

**Question 6(a)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * sketch of inverse appears as a reflection in the line
* shows correct end-point of (-2,0) and indicates continuation past
* sketch has a reasonably accurate shape (ie. crosses at roughly the correct spot)
 | 111 |

**Question 6(b)**

|  |
| --- |
| SolutionEITHER, uses point of intersection from graph,  OR, solves algebraically, |
| Marking key/mathematical behaviours | Marks |
| EITHER OR* uses point of intersection establishes equation to solve
* states value near 1.3 states value
 | 11 |

**Question 7(a)**

|  |
| --- |
| Solution$$\begin{matrix}x+3y-2z&=&3\\4x+14y-3z&=&19\\3x+12y+2z&=&21\end{matrix} ⟺ \begin{matrix}x+3y-2z&=&3\\ 2y+5z&=&7\\ 3y+8z&=&12\end{matrix} ⟺ \begin{matrix}x+3y-2z&=&3\\ 2y+5z&=&7\\ z&=&3\end{matrix}$$So $z=3$, and back-substitution gives $y=-4$ and $x=21.$ |
| Marking key/mathematical behaviours | Marks |
| * systematically eliminates variables
* solves for
* solves for  and
 | 111 |

**Question 7(b)**

|  |
| --- |
| Solution$$\begin{matrix}x+3y-2z&=&3\\4x+14y-3z&=&19\\3x+12y+az&=&b\end{matrix} ⟺ \begin{matrix}x+3y-2z&=&3\\ 2y+5z&=&7\\ 3y+\left(a+6\right)z&=&b-9\end{matrix} $$$$⟺ \begin{matrix}x+3y-2z&=&3\\ 2y+5z&=&7\\ \left(2a-3\right)z&=&2b-39\end{matrix} $$Infinitely many solutions when last equation reduces to $0z=0$,i.e. $a=1.5$ and $b=19.5$  |
| Marking key/mathematical behaviours | Marks |
| * systematically eliminates variables
* uses the condition for infinitely many solutions
* solves for  and
 | 111 |