**Taylor Series**

**In-class investigation**

**Solutions and marking key**

**Question 1(a)**

|  |  |
| --- | --- |
| Solution | |
| **x**  -  5  5  **f(x)**  -  3  -  2  -  1  1  2  3 | |
| Roots at (-3.08, 0), (0,0) and (3.08, 0)  Minimum at (-1.57, -1) Maximum at (1.57, 1) |  |
| Mathematical behaviours | Marks |
| * Correct intercepts and turning points * Correct shape of graph | 5  1 |

**Question 1(b)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Correct +/- signs for each term * Correct power of for each term * Correct factorial for each term | 1  1  1 |

**Question 1(c**)

|  |  |
| --- | --- |
| Solution | |
| **x**  -  5  5  **f(x)**  -  3  -  2  -  1  1  2  3 | |
| Roots at (-5.98,0), (-3.14,0), (0,0), (3.14,0) and (5.98,0)  Maxima at (-4.69,1) and (1.57,1) Minima at (-1.57,-1) and (4.69,-1) |  |
| Mathematical behaviours | Marks |
| * Correct intercepts and turning points * Correct shape of the graph | 5  1 |

**Question 1(d**) **–** **(e)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Solution | Mathematical behaviours | Marks | |
| (d) |  | * Correct function | 2 | |
| (e) | (i  or  (ii)  or | * Correct upper and lower boundaries * Correct upper and lower boundaries | | 2  2 |

**Question 2(a)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Correct +/- signs for each term * Correct power of for each term * Correct factorial for each term | 1  1  1 |

**Question 2(b)**

|  |  |
| --- | --- |
| Solution | |
| x  -  5  5  g(x)  -  3  -  2  -  1  1  2  3 | |
| Roots at (-4.69,0), (-1.57,0), (1.57,0) and (4.69,0)  Maximum at (0,1) Minima at (-3.14,-1) and (3.14,-1) |  |
| Mathematical behaviours | Marks |
| * Correct intercepts and turning points * Correct shape of the graph | 5  1 |

**Question 2(c) – (d)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Solution | Mathematical behaviours | Marks |
| (c) |  | * Correct function | 2 |
| (d) |  | * Correct upper and lower boundaries * Not since   is  not a good approximation for | 2 |

**Question 3(a)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Differentiates correctly * Simplifies fractions involving factorial correctly * States the relationship | 2  1  1 |

**Question 3(b)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Differentiates correctly * Simplifies fractions involving factorial correctly * States the relationship | 2  1  1 |

**Question 3(c)**

|  |  |
| --- | --- |
| Solution | |
| and | |
| Mathematical behaviours | Marks |
| * Correct relationships | 2 |

**Question 4(a)**

|  |  |
| --- | --- |
| Solution | |
| ... = | |
| Mathematical behaviours | Marks |
| * Differentiates correctly * Simplifies fractions involving factorial correctly | 1  1 |

**Question 4(b)**

|  |  |
| --- | --- |
| Solution | |
| which suggests | |
| Mathematical behaviours | Marks |
| * Identifies * Correct function | 1  1 |