Name: \_\_SOLUTIONS\_\_\_\_\_\_\_\_

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Full Test (Calc Free + Calc Assumed)

Total Time: 27 minutes

Total Marks: 22 marks

Student Result \_\_\_\_\_\_\_\_/ 22

**MATHEMATICS METHODS Unit 3**

**TEST 1 -2024: Further differentiation, integration and applications.**

**Part B**

**Calculator Free Section**

Time: 12 minutes

Total Marks: \_\_\_\_\_\_ / 10 marks

Resources allowed: SCSA Formula Sheet

**Instructions to candidates**

Show all your working clearly. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks**. For any question or part question worth more than two marks, valid working or justification is required to receive full marks.** If you repeat any question, ensure that you cancel the answer you do not wish to have marked.

|  |  |
| --- | --- |
| **Question 1** | **[2, 2, 2 = 6 marks]** |

Consider the function shown below, which is comprised of a sine wave section and several linear relationships.

<EFOFEX>
id:fxd{da776dbd-54fe-4d28-a314-babc872664b0}

FXData:
</EFOFEX>

Evaluate the following integrals.

a)

✓indicates most signed area will cancel to zero

✓determines correct value (signed area)

b)

✓applies integral property

✓determines correct value (signed area)

c)

✓indicates understanding of horizontal translation

✓determines correct value (signed area)

|  |  |
| --- | --- |
| **Question 2** | **[1, 3 = 4 marks]** |

Determine

a)

✓uses the Fundamental Theorem of Calculus

b)

✓applies definite integral property

✓applies additive property of definite integrals

✓uses the Fundamental Theorem of Calculus

Name: \_\_SOLUTIONS\_\_\_\_\_\_\_\_

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**MATHEMATICS METHODS Unit 3**

**TEST 1 -2024: Further differentiation, integration and applications.**

**Part B**

**Calculator Assumed Section**

Time: 15 minutes

Total Marks: \_\_\_\_\_\_ / 12 marks

Resources allowed:

SCSA Formula Sheet

Up to three Calculators and

One A4 sheet, both sides of notes

**Instructions to candidates**

Show all your working clearly. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. **For any question or part question worth more than two marks, valid working or justification is required to receive full marks.** If you repeat any question, ensure that you cancel the answer you do not wish to have marked.

|  |  |
| --- | --- |
| **Question 3** | **[3 marks]** |

The graph of and a table of values for the function are shown below.

<EFOFEX>
id:fxd{d068c199-e250-423d-b949-584d4b6ddf71}

FXData:

</EFOFEX>

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1 | 1.5 | 2 | 2.5 | 3 |
|  | 2.01 | 2.22 | 2.41 | 2.58 | 2.73 |

By considering the areas of the rectangles shown, demonstrate and explain why 4.79 is a reasonable estimate for:

Area of inscribed rectangles:

✓shows calculation for inscribed rectangles

Area of circumscribed rectangles:

✓shows calculation for circumscribed rectangles

Average of underestimate and overestimate:

✓indicates one is underestimate, other is overestimate and averages

May use or similar

|  |  |
| --- | --- |
| **Question 4** | **[5 marks]** |

A particle moves in a straight line so that its acceleration, ms-2, after seconds is given by

. If the initial position of the object is 2 m to the right of a fixed origin and its velocity at is 12 ms-1, find the particles position and velocity after 10 seconds.

✓integrates acceleration

Given

✓determines constant of integration

✓integrates velocity

Given ✓determines constant of integration

m

ms-1

Particle is m right of the fixed origin travelling with a velocity of ms-1.

✓states correct displacement and velocity at seconds

|  |  |
| --- | --- |
| **Question 5** | **[4 marks]** |

Using a definite integral, find the area of the region bounded by the graphs with equations:

and

Solving for points of intersection

✓determines values for points of intersection

✓shows definite integral with correct bounds

✓and correct difference of functions

(or simplifies)

units2 ✓determines correct area

**End of Test**