Mathematics Specialist Unit 4

Test 4: Calculus **Solutions**

**Student Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Time allowed for this task:** 55 minutes, in class, under test conditions

Section One – calculator-free section 35 minutes (35 marks)

Section Two – calculator-assumed section 20 minutes (20 marks)

**Materials required:** (to be provided by the student)

Calculator with CAS capability.

Formula Sheet

Notes on one unfolded sheet of A4 paper.

Standard items: Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlights.

Special items: Drawing instruments, templates, and up to three calculators approved for use in WACE examinations.

**Marks available:** 55 marks

**Task weighting: 7%**

**Section One – calculator-free section (35 marks)**

**Question 1. (10 marks)**

1. Find using a suitable trigonometric formula. (2 marks)

✓

✓

1. Find using a suitable substitution. (4 marks)

✓

✓

= ✓

=  ✓

1. Find using partial fractions. (4 marks)

Put and

✓✓

✓

✓

**Question 2. (9 marks)**

1. Determine the volume of the solid formed when the area in the first quadrant and enclosed by , the line and the is rotated through one revolution about the (4 marks)

dy ✓

dy ✓

✓

✓

1. The area in the first quadrant enclosed by the curve , the lines and the *x-*axis is rotated about the *x*-axis. If the volume of the solid generated is determine the value of the constant k. (5 marks)

*dx*

✓

✓

✓

✓

✓

**Question 3. (8 marks)**

1. Determine using the substitution. (4 marks)

✓

✓

✓

✓

1. Show that (4 marks)

✓

)) ✓

✓

✓

**Question 4. (8 marks)**

1. Use the substitution to determine (4 marks)

✓

✓

✓

✓

1. Find (4 marks)

✓

✓✓

✓

**End of Section One**

**Section Two – calculator-assumed section (20 marks)**

**Question 5. (4 marks)**

The area enclosed by the axis, the lines and and the curve is rotated about the axis. Calculate the volume of the solid generated to an accuracy of two decimal places. (4 marks)

✓

✓

✓✓

**Question 6. (6 marks)**

1. Find using partial fractions. (3 marks)

✓

**+ 2ln+**  ✓✓

1. Hence express as a single logarithm. (3 marks)

✓

✓

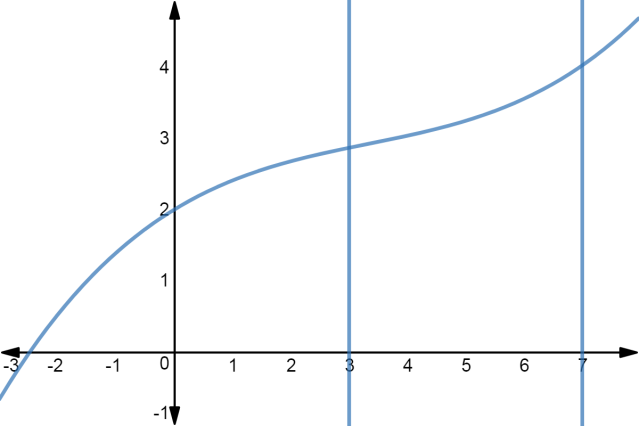
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**Question 7. (10 marks)**

|  |  |
| --- | --- |
| *x* | *f(x)* |
| 3.0 | 2.87 |
| 3.2 | 2.90 |
| 3.4 | 2.94 |
| 3.6 | 2.97 |
| 3.8 | 3.00 |
| 4.0 | 3.04 |
| 4.2 | 3.08 |
| 4.4 | 3.12 |
| 4.6 | 3.16 |
| 4.8 | 3.20 |
| 5.0 | 3.25 |
| 5.2 | 3.30 |
| 5.4 | 3.36 |
| 5.6 | 3.42 |
| 5.8 | 3.49 |
| 6.0 | 3.56 |
| 6.2 | 3.64 |
| 6.4 | 3.73 |
| 6.6 | 3.82 |
| 6.8 | 3.92 |
| 7.0 | 4.03 |

Consider the region enclosed by the curve

and the axis. y



x

The accompanying table shows the value of the function for

various values of

The value of the area of this region is which may be approximated

using the Trapezoidal rule:

or using Simpson’s rule:

where, in each case, and

1. Use Simpson’s rule over 4 intervals to approximate (3 marks)

✓

✓

✓

1. Use the Trapezoidal rule over 5 intervals to approximate (3 marks)

✓

✓

✓

1. For the following sums were determined

and

Use these sums and Simpson’s rule over 20 intervals to estimate the area of the region.

(4 marks)

✓

✓

✓

✓

**End of Section Two**