

ST STITHIANS GIRLS COLLEGE

MATHEMATICS

ADVANCED PROGRAMME MATHEMATICS: GRADE 12

DATE: 31 July 2014 TIME: 2 hours

 MARKS: 110

**NAME: TEACHER:**

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 5 pages.

2. A**nswer Question 5 on the answer sheet provided.**

3. Read the questions carefully.

4. You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.

5. Unless otherwise stated, round answers to **two** decimal places where necessary.

6. All the necessary working details must be clearly shown.

7. It is in your own interest to write legibly and to present your work neatly.

**QUESTION: 1**

Use Mathematical induction to prove that:

 is divisible by 13 for all  **[7]**

**QUESTION: 2**

Evaluate the following:

(a)  (6)

(b)  (4)

 **[10]**

**QUESTION: 3**

(a) Given  with .

 Solve for *x* fully if  and  (6)

(b) If , decompose into partial fractions. (5)

 **[11]**

**QUESTION: 4**

(a) Prove the identity:

  (5)

(b) Given  and  .

 Find  in simplest form. (3)

(c) Points A and B lie on the circle with centre O. The area of the minor sector AOB is

 72 cm2. The **perimeter** of the minor sector is 36 cm. Calculate the radius of the circle.

B

A

O

 (8)

 **[16]**

**QUESTION: 5 (ANSWER ON THE SHEET PROVIDED)**

The sketch shows the graph of  and , which intersect

at A (-2; 2) and B.



(a) Determine the *x* - value of the point B (leave you answer in surd form) (4)

(b) Draw  on the axes provided. (3)

 **[7]**

**QUESTION: 6**

(a) Given the function: 

 (1) Find the value of *a*  if *f* is continuous at  (3)

 (2) Assuming that , prove that *f* is differentiable at  (4)

(c) Given: , which is sketched below.



•

 A

 Use Newton’s Method to calculate the *x*-value of the coordinate at A, correct to

 5 decimal digits. (Show working steps). (5)

 **[12]**

**QUESTION: 7**

(a) Find the derivatives of the following functions: (you do not need to simplify

 your answers)

 (1)  (3)

 (2)  (4)

(b) Find an expression for  in terms of *x* and *y* for the implicitly defined curve  (5)

(c) Given: 

 (1) Determine , without the use of a calculator. (3)

 (2) Determine (4)

 (3) Determine the equation of the tangent to at  (3)

 **[22]**

**QUESTION: 8**

The function *f* is given by 

(a) Show that  can be written as  (2)

(b) Hence, or otherwise:

 (1) show that there is no stationary point. (4)

 (2) determine all the intercepts with the axes. (3)

 (3) find the equation of the oblique asymptote. (2)

(c) Sketch the curve , clearly showing asymptotes and intercepts with the

 axes. All relevant working must be shown. (6)

 **[17]**

**QUESTION: 9**

(a) Given . Determine the equation of , the inverse of 

 in the form  (2)

 (b) Solve for x:  (6)

 **[8]**