

EXAMINATION: MATHEMATICS PAPER 1

 TRIALS EXAMINATION

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MODERATOR M. DWYER

GRADE: GRADE 12

DATE: Thursday 23rd  August 2012

TIME : 8 - 11

DURATION: 3 HOURS

TOTAL: 150 marks

**Instructions:**

* This question paper consists of 9 pages , a Formula Sheet and a Diagram Sheet

 Please check that your paper is complete

* Read the questions carefully.
* Answer all questions.
* Number your answers exactly as the questions are numbered.
* Please do Section A in a separate booklet from Section B.
* All the necessary working details must be clearly shown.
* You may use an approved non-programmable and non-graphical calculator, unless a specific question prohibits the use of a calculator.
* Round off your answers to 2 decimal digits where necessary.
* It is in your own interest to write legibly and to present your work neatly.
* Please ensure that you **hand in your Diagram sheet** with your answers.

**SECTION A ( 70 marks )**

1.1 Solve for ( correct to 2 decimal places where necessary )

 1.1.1 42 = 6 + 1 (3)

 1.1.2 log ( 4 – 1 ) = 3 – log 3 (3)

 1.1.3 2. 36x+1  = 606 (3)

1.2 Simplify (without the use of a calculator)

 1.2.1 (3)

1.2.2 (5)

 [17]

2.1 Find  (3)

2.2 Determine f’(x) from first principles if f(x) = 6 + 3x2 (4)

2.3 Find for each of the following:

 2.3.1 9x – 3y = 30 (2)

 2.3.2 y= + (5)

 [14]

3.1 Given the Arithmetic Sequence: 55; 48; 41; 34;……

 Determine:

3.1.1 the 42nd term. (3)

3.1.2 which term equals -379. (3)

3.2 The sum of n terms of a series is given by the formula:

 Find the 6th term of the series. (4)

3.3 A sequence of isosceles triangles is drawn. The first triangle has a base of 2cm and

 height of 2cm. The second triangle has a base that is 2cm longer than the base of

 the first triangle and its height is 1cm longer than the height of the first triangle.

 This pattern of enlargement will continue with each triangle that follows.

 Determine the area of the 100th triangle. (4)

3.4 Calculate the sum of the following series: (4)

 [18]

4.1 In a certain area north of the Tugela River , rhino poaching has increased dramatically over the last three years. The number of rhino at the end of 2009 was 450 and the projected number for the end of 2012 is 125.

 4.1.1 What is the rate of decrease per year ( use a reducing balance ) (3)

 4.1.2 Using this rate of decrease when will the number of rhino be less than 20

 in that area? (3)

4. 2 Jennifer Rich needed to choose a bank to invest her money. There were two options

* Euro bank which offers 12,7%p.a. compounded monthly or
* Dollar bank which offers 12,9% p.a. compounded semi-annually.

 Which bank offers the better rate ? ( show all working ) (5) [11]

5. The equation of the hyperbola is given by

 Write down the equation of the image after each of the following transformations on

 Write your answers in the form

 5.1 a vertical shift of 1 unit (1)

 5.2 a horizontal shift of -2 units (1)

 5.3 the equations of the new asymptotes are and (2)

 [4]

6. Refer to the figure where the curve of is shown. is a point on the graph of

0

 6.1 Determine the value of. (2) 6.2 Determine the equation of, symmetrical to about the x-axis, in the

 form of (1)

 6.3 If and are symmetrical about the line , write down the equation of (2)

 6.4 write down the domain of . (1)

 [6]

**SECTION B ( 80 marks )**

 

7.1. A young couple want to buy a house for R 800 000. They pay a deposit of R 180 000 and they plan to organize a bond to pay off the rest. They will pay equal monthly installments for the next ten years. The bank offers a rate of 8%p.a. compounded monthly.

 7.1.1 How much money do they need for a bond? (1)

 7.1.2. What will their monthly installments be if they pay the money at the end of each month ? (4)

 7.1.3. The couple receive some money from a relative after 3 years. They hope to pay off the bond with this money. What is the balance outstanding after 3 years ?  **(4)**

 [9]

8.1 A point is on the graph of p. The point is the corresponding point

 on the graph of . Determine the value of . (2)

8.2 Given: ;

 8.2.1 Find the equation of in the form y=….. (3)

 8.2.2 sketch the graphs of f and on the same system of axes on the

 diagram sheet (4)

 [9]

9. is a curve which intersects the axis at (-4;0) and ( 2;0) and g(x) =

A

C

x

0

-4

2

B

9.1. Find the values of a , b and c. (3)

9.2. Show that the equation of f(x) is f(x) = ½ x2 +x – 4 if f passes through

 the point ( -6;8) (4)

 9.3. Find the length of AB where OC=1. (2)

9.4. For which values of x is g(x) f(x) , if x 0 (2)

9.5. Write down the equations of the axes of symmetry of g(x). (3)

9.6. If a tangent is drawn to f(x) at a point P where the gradient is 1, find the

 co-ordinates of P. (3)

 [17]

10. Consider the series: 

 10.1 For which values of will the series shown above converge? (3)

 10.2 If , calculate the sum to infinity of this series. (3)

 10.3 Three numbers a, b, 9 are in geometric sequence. If 1 is subtracted from

 the first term then the sequence becomes arithmetic. Find the values of a and b. (5)

 [11]

11.1 Given:

 11.1 .1 Write down the coordinates of the intercepts the graph makes with the axes .(3)

 11.1.2 Sketch the curve of on the grid provided. Clearly show the co ordinates of all stationary points and intercepts with the axes. (6)

11.2 Find the average gradient of the curve between x = -1 and x = 5. (3)

11.3 Find if . (3) [15]

12 Car A and Car B are moving along parallel straight lines on a highway.

 Their positions are given by

 SA = 10t2+ 80t SB = 30t2 + 20t + 40 ( **t** is in minutes , distance (**S**) is in metres)

 Car A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_Car B\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

12.1 How far ahead of Car A is Car B at the start? (1)

12.2 Which car is ahead at the time when the two cars are travelling at the same speed? (4)

 [5]

13. Mr. Ecology wants to build a cylindrical tank with a lid to collect the rainwater from his roof. He plans to build it of galvanized sheet metal. The tank needs to hold 16m3 of water.

 13.1. Show that the height (h) of the cylinder can be expressed as

 h =

 ( Where is the radius)

 and hence the surface area is

 (3)

 13.2 Find the value of so that Mr Ecology can use the smallest amount of

 sheet metal possible (4) [7]

14.1. If

 14.1.1 Determine in terms of m (2)

 14.1.2. For which positive, integral value/s of m will the solution for be an integer ? (2)

14.2. 256 – 1 is exactly divisible by two integers between 120 and 135.

Find these two integers without using a calculator. (Show all working) (3)

 [7]

**DIAGRAM SHEET**-Ensure you hand this in with your answer booklet.

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Question 8.2.2

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|  |  |  |  | 6 |  |  |  |  |  |
|  |  |  |  | 5 |  |  |  |  |  |
|  |  |  |  | 4 |  |  |  |  |  |
|  |  |  |  | 3 |  |  |  |  |  |
|  |  |  |  | 2 |  |  |  |  |  |
|  |  |  |  | 10 |  |  |  |  |  |
| -5 | -4 | -3 | -2 | -1 | 1 | 2 | 3 | 4 | 5 |
|  |  |  |  | -1 |  |  |  |  |  |
|  |  |  |  | -2 |  |  |  |  |  |
|  |  |  |  | -3 |  |  |  |  |  |
|  |  |  |  | -4 |  |  |  |  |  |
|  |  |  |  | -5 |  |  |  |  |  |

Question 11.1.2