



RONDEBOSCH BOYS' HIGH SCHOOL

GRADE 11 MATHEMATICS PAPER 1

10 NOVEMBER 2014

TIME: 3 HOURS

MARKS: 150

EXAMINER: T EDWARDS
MODERATOR: R HARMUTH

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 QUESTIONS
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera which you have used in determining the answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You MAY use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers to TWO decimal places.
7. Number the answers correctly according to the numbering system used in this question paper.
8. Begin each question on a NEW PAGE.
9. Write neatly and legibly.

Question 1

Solve for x

1.1 $x^2 - 5x - 24 = 0$ (3)

1.2 $3x^2 - 4 = 5x$ (4)

1.3 $4 - x = \sqrt{x - 2}$ (5)

1.4 $x^{\frac{1}{2}} + 6x^{\frac{1}{4}} - 27 = 0$ (5)

1.5 $\frac{1}{x+1} + \frac{2x}{x-1} = 1$ (6)

1.6 $\frac{3}{x-4} \leq 2$ (6)

[29]

Question 2

2.1 Solve for x and y :

$x - 2y - 1 = 0$ and $y^2 + x^2 = 9 + 2xy$ (9)

2.2 Kate can finish her school project in 2 hours less than Simon. They could have finished the projects in $2\frac{2}{5}$ hours if they had worked together. How long does each one take to do the work on his/her own? (9)

[18]

Question 3

3.1 Given: $W = \sqrt{\frac{x-2}{2x}}$

Calculate the values of x for which W is non-real (3)

3.2 For which values of t will $4x^2 - 6x = 2t$ have real roots? (4)

[7]

Question 4

Consider the sequences in the table below

Term	1	2	3	4	5
Sequence 1	4	6	8	10	a
Sequence 2	3	8	15	24	b
Sequence 3	5	10	17	c	

Each term in Sequence 3 is obtained by adding the squares of the corresponding terms in Sequence 1 and 2 and then square rooting the result. For example for the 1st term $\sqrt{4^2 + 3^2} = 5$

- 4.1 Determine the values of a , b and c . (3)
- 4.2 Determine the n^{th} term (T_n) for Sequence 1. (2)
- 4.3 The n^{th} term of Sequence 2 is $n^2 + kn$. Calculate the value of k . (2)
- 4.4 Hence, without any further calculation, determine the n^{th} term (T_n) for Sequence 3. (2)
- 4.5 Hence, determine T_{17} in Sequence 3. (2)

[11]

Question 5

The first four terms of a quadratic pattern are +20 ; 24 ; $x + 8$ and 14. Showing **ALL** your working, find T_n .

[9]

Question 6

Consider the given series: $\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \frac{1}{4 \times 5} + \dots$

Determine:

- 6.1 The sum of the first 2 terms (1)
- 6.2 The sum of the first 3 terms (1)
- 6.3 The sum of the first 4 terms (1)
- 6.4 The sum to the n^{th} term (2)
- 6.5 Hence determine the value of $\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \frac{1}{4 \times 5} + \dots + \frac{1}{2013 \times 2014}$ (2)

[7]

Question 7

$$F = \frac{x[(1+i)^n - 1]}{i} \quad \text{and} \quad P = \frac{x[1 - (1+i)^{-n}]}{i}$$

- 7.1 Neil invests R36 000 at 15% p.a. compounded monthly for a period of 9 years.
- 7.1.1 Calculate the future value of the investment. (3)
- 7.1.2 Determine the effective annual interest rate. (4)
- 7.2 Between 2001 and 2011 (i.e. 10 years), the Western Cape population grew from 4 524 264 individuals to 5 822 734. Calculate the population growth rate. (4)
- 7.3 John took out a loan in order to buy a vehicle. He makes monthly repayments of R600 and interest is charged at 7% p.a. compounded monthly. If he is required to pay the loan back over a period of 8 years, calculate the amount of money he loaned. (4)
- 7.4 Mhlali wishes to save for his future studies. He deposits Rx each month into an account for a period of 10 years. If interest is 8,5% p.a. compounded monthly and he ends up saving R94 069,21, calculate x . (4)

[19]

Question 8

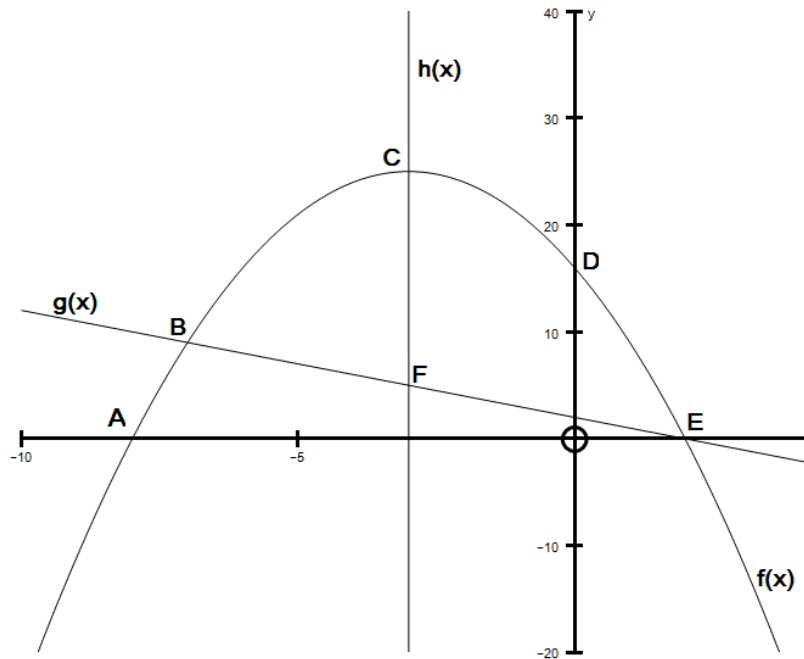
Given $f(x) = \frac{5}{x-5} + 4$

- 8.1 Write down the domain of f . (2)
- 8.2 For which value of x is $f(x) = 0$. (3)
- 8.3 Determine the value of p , if $A(0; p)$ lies on the graph of f . (2)
- 8.4 Write down the equations of the asymptotes of f . (2)
- 8.5 Draw a neat sketch of f , indicating the asymptotes and intercepts with the axes. (4)
- 8.6 Determine the equation of one line of symmetry. (2)
- 8.7 If $f(x)$ is translated 4 units up and one unit left to become $g(x)$, write down the new equation of g . (2)

[17]

Question 9

Sketched below are the graphs of $f(x)$, $g(x)$ and $h(x)$. $f(x)$ and $g(x)$ intersect at B and E . The parabola cuts the x -axis at $A(-8; 0)$ and E respectively and the y -axis at $D(0; 16)$. It is given that $g(x) = -x + 2$ and $h(x)$ is parallel to the y -axis.



- 9.1 Calculate the co-ordinates of E. (2)
- 9.2 Prove that $f(x) = -x^2 - 6x + 16$. (4)
- 9.3 Calculate the co-ordinates of B. (5)
- 9.4 Determine the equation of $h(x)$. (1)
- 9.5 Calculate the co-ordinates of C, the turning point of $f(x)$. (3)
- 9.6 Determine the average gradient between B and C. (2)
- 9.7 Calculate the length of CF. (4)
- 9.8 Give the values of x for which:
- 9.8.1 $f(x) \geq 0$ (2)
- 9.8.2 $f(x) \cdot g(x) > 0$ (2)
- 9.9 Write down the new equation of $f(x)$ if it is shifted three units down and two units right. (4)

[29]

Question 10

If the graph of $y = -x^2 + 6x - 5$ is reflected in the x -axis and the resulting graph is then reflected in the y -axis, determine the new equation. (4)