

RONDEBOSCH BOYS' HIGH SCHOOL

Grade 11

MATHEMATICS

PAPER ONE

Monday 25th May 2015



Set D. Geldenhuys

Moderated by S. Carletti

Two Hours

100 Marks

1. *Calculators can be used, unless otherwise stated, with answers corrected to two decimal places.*
2. ***All necessary working MUST be shown.*** *Answers only will **NOT** necessarily be awarded full marks.*
3. *When necessary, leave answers with positive exponents.*
4. *Graphs drawn in this paper are **NOT** necessarily drawn to scale.*
5. *Number your answers as the questions are numbered.*
6. *Untidy work will be penalised.*
7. *Only **blue and black pens** may be used.*
8. *Sketches may be done in pencil.*
9. *This exam contains **EIGHT questions.***

Question 1

1.1 Solve for x :

1.1.1 $x^2 - 2x = 24$ (3)

1.1.2 $2x^2 - 3x - 7 = 0$ (3)

1.1.3 $\sqrt{x+5} = x - 1$ (5)

1.1.4 $\frac{-4x+15}{2} \geq 2x^2$ (4)

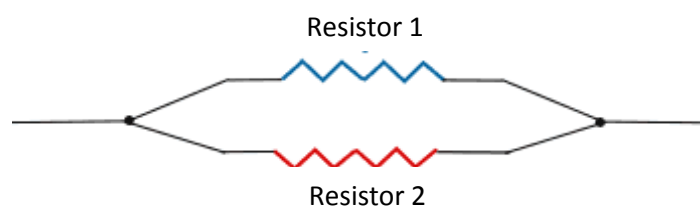
1.2 Solve for x and y :

$y = x^2 - 7x + 6$ and

$y = -x + 1$ (5)

1.3 When two resistors are in parallel, you can calculate the resistance using the following equation:

$$\frac{1}{R_{parallel}} = \frac{1}{R_1} + \frac{1}{R_2}$$



In the diagram above, the total resistance has been measured at 2 Ohms, and one of the resistors is known to be 3 Ohms more than the other. By using an equation, what is the value of each resistor? (7)

1.4 If k is a root of $x^2 - 5x + 2$, find, without solving for k , the value of $(k - 2)(k - 3)$. (3)

[30]

Question 2

2.1 Without solving the equation, determine the nature of the roots
of: $x^2 - 3x - 3 = 0$ (4)

2.2 For which values of b will the equation $2x^2 + 2x + b = x$ have
real roots? (5)

[9]

Question 3

3.1 Simplify: $\frac{15^x \cdot 75^{1-x}}{5^{-x+1}}$ (3)

3.2 Solve for x : $7^{2x+1} + 49^x = 56$ (5)

3.3 If $\frac{5}{\sqrt{3}+2} = a + b\sqrt{c}$; find, without using a calculator, the values
of a ; b and c . (5)

[13]

Question 4

4.1 Given the quadratic sequence $-4; -2; 2; 8; \dots$

4.1.1 Determine the n^{th} term of this sequence. (4)

4.1.2 Determine the 20th term of this sequence. (2)

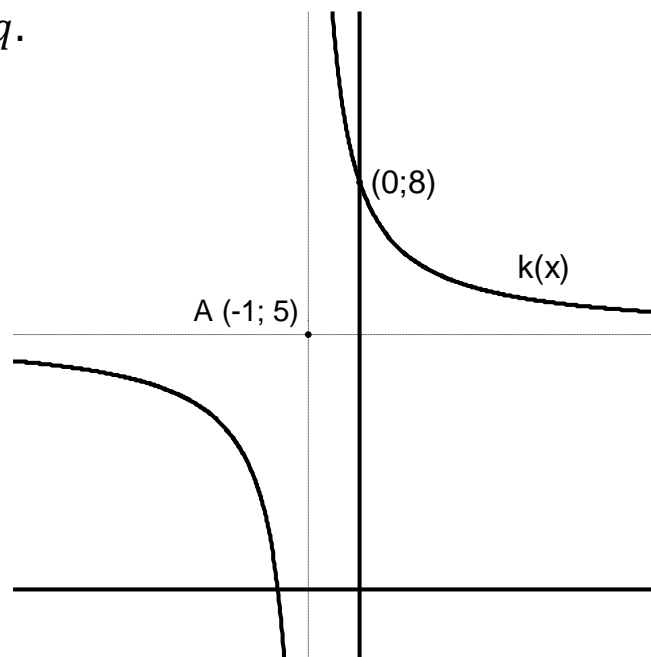
4.2 Given $1; x; y; 16; 24$

It is given that $\frac{y}{x} = x$ and that the last four numbers form a quadratic sequence. Solve for x and y . (7)

[13]

Question 5

Given: $k(x) = \frac{3}{x-p} + q$.



5.1 Calculate the values of p and q . (2)

5.2 Determine the equation of one of the lines of symmetry. (2)

[4]

Question 6

Given: $t(x) = -2 \cdot 2^{x+1} + 8$

6.1 Draw a neat sketch of graph $t(x)$, clearly showing asymptote(s) as well as the x and y intercepts. (4)

6.2 Write down the **range** of the new graph after $t(x)$ is reflected in the $x - axis$ and shifted 2 units down. (2)

[6]

Question 7

Given the expression $h(x) = -x^2 + 4x - 1$.

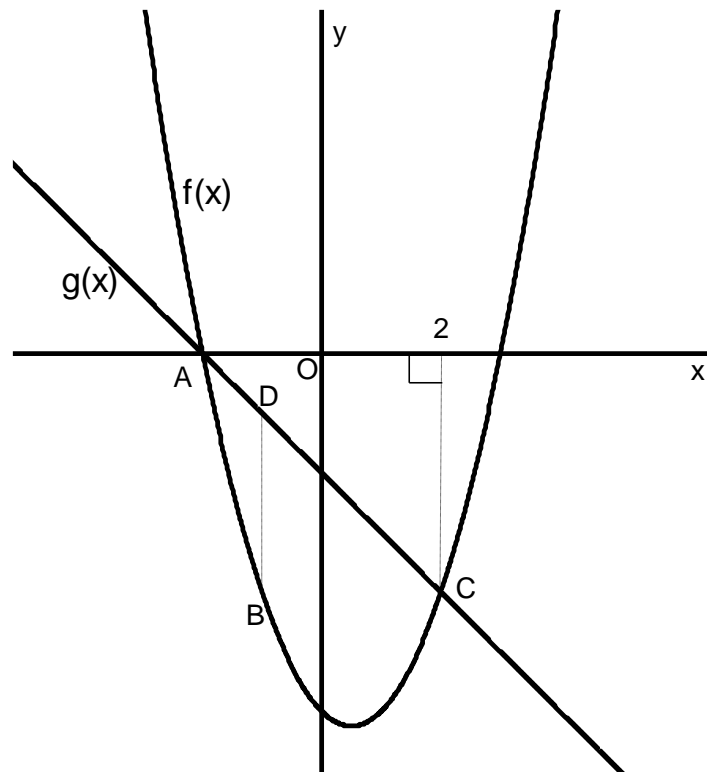
7.1 Write the above expression in the form $h(x) = a(x - p)^2 + q$. (3)

7.2 Give the equation of $k(x)$ if $h(x)$ is translated 3 units right and 1 unit up? (2)

[5]

Question 8

The graphs of $f(x) = x^2 - x - 6$ and $g(x) = mx + c$ are drawn below.



- 8.1 Determine the length of OA. (3)
- 8.2 Determine the x and y values of the turning point of $f(x)$. (2)
- 8.3 Determine the co-ordinates of point C. (2)
- 8.4 Determine the values of m and c . (4)
- 8.5 DB is a vertical line with D on $g(x)$ and B on $f(x)$. Determine for which value of x DB will have a maximum length. (4)
- 8.6 Determine the values of x for which $f(x) - g(x) < 0$. (1)
- 8.7 If $g(x) = -x - 2$, find $f(g(x))$ in terms of x . Simplify your answer. (4)

[20]

[TOTAL 100]