

RONDEBOSCH BOYS' HIGH SCHOOL

Grade 11

MATHEMATICS

PAPER ONE

Friday 30th May 2014



Set by P. Ghignone

Moderated by T. Edwards

Two Hours

100 Marks

INSTRUCTIONS

1. *Calculators can be used, unless otherwise stated, with answers corrected to two decimal places.*
2. ***All necessary working MUST be shown.***
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 $x(x - 4) = 0$ (2)

1.1.2 $x^2 + 6x - 16 = 0$ (3)

1.1.3 $5x^2 - 2x - 8 = 0$ (4)

1.2 Solve for x and y (if x and $y \in \mathbb{R}$):

$$(3x + 2)(y^2 + 9) = 0 \quad (3)$$

1.3 The roots of a quadratic equation of form $x^2 + bx + c = 0$ are $1 - \sqrt{2}$ and $1 + \sqrt{2}$. Determine the values of b and c . (3)

[15]

Question 2

2.1 For which values of r will $4x^2 + 3x + r = 0$ have real roots? (3)

2.2 A race requires an athlete to run 10km and cycle 50km . James runs at a speed of $x \text{ km/h}$ and cycles at a speed 31 km/h faster.

He takes $\frac{10}{x}$ hours for the 10km run.

2.2.1 Express the time taken for his cycle in terms of x . (1)

2.2.2 Calculate the speed, correct to 2 decimal places, at which James must run in order to finish the race (run and cycle) in 2 hours .

(7)

[11]

Question 3

3.1 Simplify:

3.1.1 $(x + y)^{-1}$ (1)

3.1.2 $\frac{3x^4y^5}{12x^7y^0}$ (3)

3.1.3 $\frac{\sqrt{a} \cdot \sqrt[4]{b^3}}{(a^2b^3)^{\frac{1}{4}}}$ (4)

3.2 Solve for x :

3.2.1 $5 \cdot 5^x = 625$ (3)

3.2.2 $x\sqrt{x} = 8$ (without the use of a calculator) (4)

3.2.3 $3^{x+2} + 3^{x-1} = 84$ (4)

3.3 Solve for x : $\sqrt{x+6} = x$ (5)

[24]

Question 4

4.1 Consider the pattern:

JACKETSJACKETSJACKETSJAC...

Which letter is the 2235th letter? (2)

4.2 The first three terms of a linear (arithmetic) sequence are $(1 - 5x)$; $(-3x)$ and $(x - 8)$. Determine the value of x . (3)

[5]

Question 5

The n^{th} term of a sequence is given by $T_n = -2(n - 3)^2 + 15$.

5.1 Write down the first three terms of the sequence. (3)

5.2 Which term of the sequence will have the greatest value? (1)

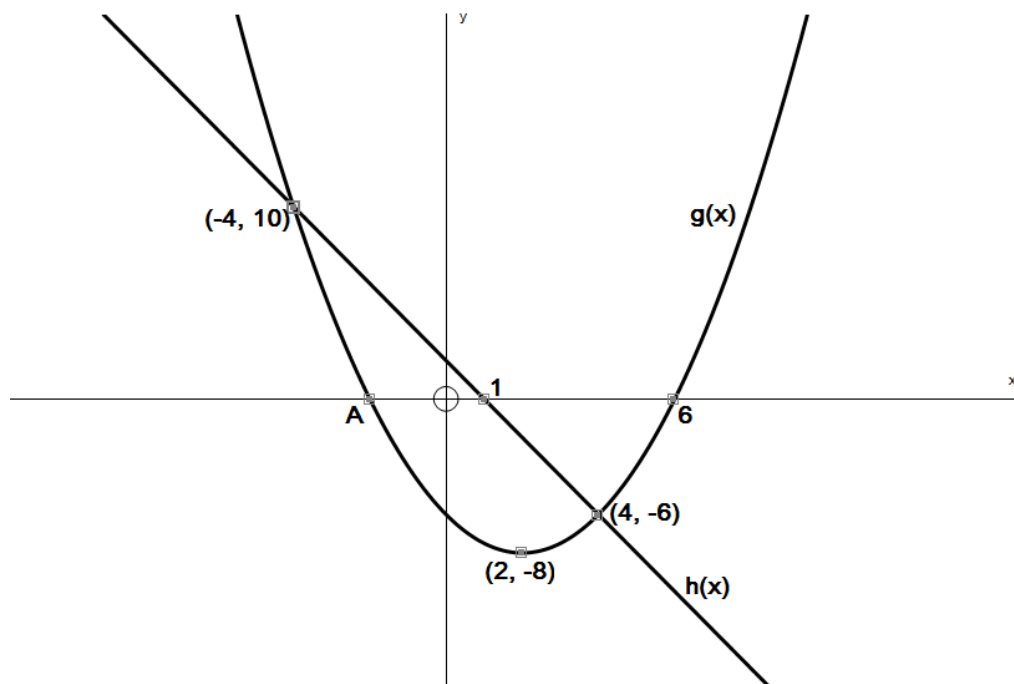
5.3 What is the second difference of this sequence? (2)

5.4 Determine ALL values of n for which the terms of this sequence will be greater than -83 . (6)

[12]

Question 6

The graphs of $g(x)$ and $h(x) = -2x + 2$ are drawn below. Graph $h(x)$ cuts the x -axis at $x = 1$ and cuts the graph $g(x)$ at $(4; -6)$ and $(-4; 10)$. Graph $g(x)$ has x -intercepts at $x = 6$ and A , and a turning point at $(2; -8)$.



- 6.1 Determine the co-ordinates of A . (2)
- 6.2 Write down the range of graph g . (2)
- 6.3 Determine the average gradient of graph g between $x = -4$ and $x = 4$. (2)
- 6.4 What will the equation of h become if the graph is moved 1 unit left and 2 units down? (2)
- 6.5 Find the equation of $g(x)$. (4)
- 6.6 For which values of x is $\frac{g(x)}{h(x)} \geq 0$? (3)

[15]

Question 7

Given: $k(x) = \frac{6}{x+2} + 4$ and $g(x) = x + 1$.

7.1 Write down the domain of graph $k(x)$. (1)

7.2 Calculate the co-ordinates of the points of intersection of graphs k and g . (7)

7.3 Draw a neat sketch of graph k , clearly showing asymptotes as well as the x and y intercepts. (6)

[14]

Question 8

An exponential graph with equation $y = 4 \cdot a^{x+p} + q$ has the following properties:

- Domain: $x \in \mathbb{R}$
- Range: $y \in \mathbb{R}; y > -8$
- The y -intercept is $y = -6$
- The graph passes through the point $(3; 8)$

Make a neat sketch of this exponential graph, showing all the information supplied above. [4]

[TOTAL 100]