

**RONDEBOSCH BOYS' HIGH SCHOOL**



**GRADE 11**

**MATHEMATICS PAPER 1  
27 MAY 2016**

**MARKS: 100**

**EXAMINER: P GHIGNONE**

**TIME: 2 HOURS**

**MODERATORS: D GELDENHUYS**

**This question paper consists of 7 questions.**

**Instructions**

1. Calculators may be used, unless otherwise stated, with answers correct to 2 decimal places.
2. All necessary working must be shown. Answers only will not necessarily be awarded full marks.
3. Where necessary, leave answers with positive exponents.
4. Graphs are not drawn to scale.
5. Number your answers as the questions are numbered.
6. Untidy work will be penalised.
7. Only blue or black ink to be used.
8. Sketches may be done in pencil.
9. Please place your question paper inside your answer book.

**Question 1**1.1 Solve for  $x$ :

1.1.1  $(2x - 1)(x + 2) = 1 - 2x$  (4)

1.1.2  $2x^2 - 6x - 7 = 0$  (3)

1.1.3  $\sqrt{4x - 3} = x - 2$  (5)

1.1.4  $2^{2x} + 7 \cdot 2^x = 8$  (5)

1.2 Solve for  $x$  and  $y$ :

$2y - 6x = 4$

$y = 3x^2 + 6x - 4$  (6)

[23]

**Question 2**2.1 Consider:  $y - \frac{1}{4y} - \frac{4}{3} = 0$ 2.1.1 Solve for  $y$ . (4)2.1.2 Hence, or otherwise, solve for  $x$ :

$$\frac{2x-1}{2x} - \frac{x}{2(2x-1)} - \frac{4}{3} = 0$$
 (4)

2.2 Given:  $f(x) = \frac{\sqrt{x+2}}{3-3x^2}$ , for which values of  $x$  is  $f(x) \geq 0$ ? (4)2.3 Show that the curve of  $y = (x + n)^2 - nx$  will not have any real roots for all real values of  $n$  ( $n \neq 0$ ). (3)

[15]

**Question 3**

Simplify the following without the use of a calculator:

3.1  $\frac{2 \cdot 3^x - 3^{x-2}}{2 \cdot 3^{x-2}}$  (3)

3.2  $\frac{a^{-2} - b^{-2}}{b^2 - a^2}$  (3)

[6]

**Question 4**

4.1 Consider the pattern: 3;  $p$ ; 10;  $q$ ; 21; ...

The pattern has a constant second difference of 1.

4.1.1 Show that  $p = 6$  and  $q = 15$ . (4)

4.1.2 Calculate the general term ( $T_n$ ) of the pattern. (4)

4.1.3 Will 210 be a term in the pattern? Show all working. (3)

4.1.4 Prove that the sum of any two consecutive numbers in the pattern equals a square number. (3)

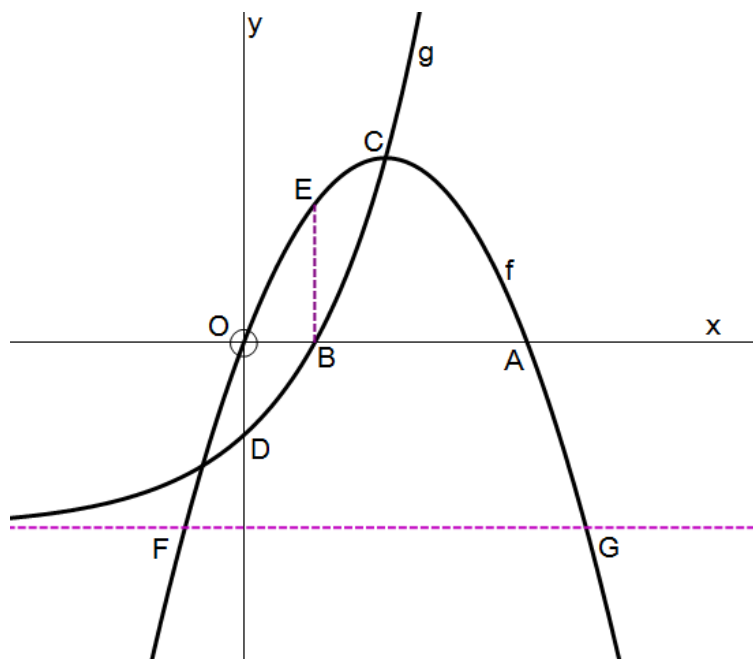
4.2 A linear pattern with 100 terms has a common difference of 3 and exactly 20 negative terms. Write down the first three terms of a possible sequence.

(3)

[17]

**Question 5**

The diagram represents the graphs of  $f(x) = -x^2 + 4x$  and  $g(x) = 2^{x+1} - 4$ .



Determine the length of the following:

- 5.1 OA (2)
- 5.2 OB (3)
- 5.3 EB (2)
- 5.4 FG, leave your answer in simplified surd form. (3)

[10]

**Question 6**

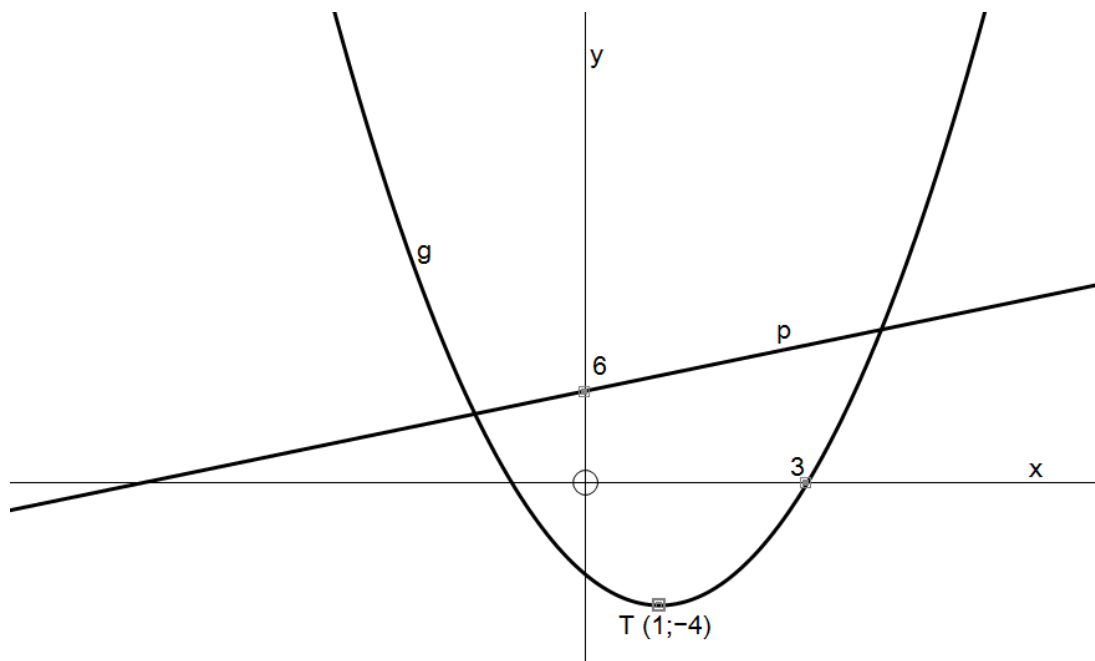
Given  $h(x) = \frac{5}{x+2} - 3$

- 6.1 Write down the equations of the asymptotes. (2)
- 6.2 Calculate the intercepts with the axes. (4)
- 6.3 Sketch the graph of  $h$ , showing all important information. (4)
- 6.4 Write down the range of  $h(x) + 1$  (1)
- 6.5 What does the equation of  $h$  become if the graph is rotated  $90^\circ$  clockwise about the origin? (3)

[14]

**Question 7**

The graph of  $g(x) = ax^2 + bx + c$  and  $p(x) = \frac{1}{2}x + 6$  is given.  $T(1; -4)$  is the turning point of  $g(x)$ .



- 7.1 Show that the equation of  $g$  is  $g(x) = x^2 - 2x - 3$ . (3)
- 7.2 Determine the coordinates of the points of intersection of  $g(x)$  and  $p(x)$ . (5)
- 7.3 Determine the values of  $x$  for which:
- 7.3.1  $g(x) - p(x) \leq 0$  (2)
- 7.3.2  $-g(x) \cdot x \geq 0$  (3)
- 7.4 For which values of  $k$  will  $x^2 - 2x - 5 = k$  have 2 positive roots? (2)
- [15]

**[TOTAL 100]**