HILLCREST HIGH SCHOOL

Grade 11 Paper 1 Exam

June 2016

Examiner: Mrs Sparks Moderator: MrsMoodley

MARKS: 100 TIME: 2 hours

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 7questions.Answer ALL the questions.
2. Write your name and **your Mathematics teacher**'s name on your answer booklet.
3. Clearly show ALL calculations, diagrams, graphs, etc which you have used to determine youranswers.
4. Answers only will NOTnecessarily be awarded full marks.
5. An approved scientific calculator (non-programmable)may be used, unless otherwise stated.
6. If necessary, answers should be rounded off to TWO decimal places, unless otherwise stated.
7. Number the answers EXACTLY as the questions are numbered.
8. Diagrams are not necessarily drawn to scale.
9. It is in your own interest to write legibly and to present your work neatly.

QUESTION 1

1.1 Simplify the following expressions without the use of a calculator.

1.1.1 $\frac{\sqrt{50}+\sqrt{8}}{7\sqrt{2}}$ (3)

1.1.2 $\left[\frac{16\sqrt{x}}{81x^{\frac{11}{6}}}\right]^{\frac{-3}{4}}$ (4)

1.2 Solve for x: $27^{x^2+x} = 3^{3x^2} \times 9$ (3)

1.3 If $5^{-x} = 10$, determine the value of $\frac{2^{x-1}+2^{x+1}}{5.10^x}$ (5)

[15]

QUESTION 2

2.1 Solve for x. Round off to TWO decimal places, if necessary.

2.1.1 $x^2 - 7x + 12 = 0$ (2)

2.1.2 $6x - 7 = \frac{4}{x}$ (4)

2.2 Solve for x if:

2.2.1 $-4x + 3 < -2.$ (2)

2.2.2 $x^2 - 3x \leq 40$ (4)

2.3 Solve for x and y in the following simultaneous equations:

$x + y + 2 = 0$ and $x^2 + y^2 = 4$ (5)

2.4 Without solving the equations, fully determine the nature of the roots of

2.4.1 $4x^2 - 12x + 9 = 0$ (3)

2.4.2 $ax^2 + bx + c = 0$ if $a < 0, b > 0$ and $c = 0$. (2)

2.5 Determine for which value(s) of p will $2x^2 + 4x + 4 - p^2 = 0$ have no real roots. (3)

[25]

QUESTION 3

The first term of a linear number pattern is 92 and the constant difference is -4.

3.1 Write down the value of the second and third terms of the number pattern. (1)

3.2 Determine an expression for the nth term of the number pattern. (2)

3.3 Determine the value of the eighteenth term. (2)

3.4 If $T_p + T_q = 0$, determine the value of $(p + q)$. (2)

[7]

QUESTION 4

4.1 The following number pattern has a constant second difference.

41; 43; 47; 53; 61; 71; 83; 97; 113; 131; 151; 173; 197; 223; 251; …

4.1.1 Write down the value of the constant second difference. (1)

4.1.2 Determine an expression for the nth term of the number pattern. (4)

4.1.3 The first forty terms of the number pattern are all prime numbers. Determine the forty-first term and show that it is not a prime number. (2)

4.1.4 Determine the units digit of the 49 999 998th ($T_{49\,999\,998}$) term. (2)

4.2 The nth term of a number pattern is as follows:

$T_n = -5n - 4$if$n$ is an even number and $T_n = -n^2 + 6$ if n is an uneven number.

Determine the value of $T_{6+}T_{7.}$ (3)

[12]

QUESTION 5

Given the following two functions:

$h(x) = \frac{1}{x} + 5$ and $g(x) = x + 5$

5.1 Determine the *x*-intercept of *h*. (3)

5.2 Sketch the graphs of *h* and *g* on the set of axes provided on your Diagram Sheet in your answer booklet. Clearly show all intercepts with the axes as well as asymptotes. (5)

5.3 Give the equation of the vertical asymptote of *h*. (1)

5.4 Determine the coordinates of the points of intersection of *h* and *g*. Show all calculations. (5)

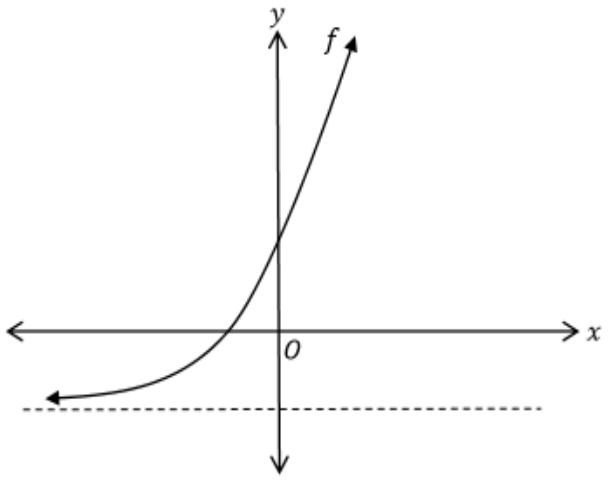
5.5 Write down the equation of f if f is the reflection of g about the *x*-axis. (2)

5.6 Write down the new equationof h if h is shifted left 2 units and down 2 units. (2)

[18]

QUESTION 6

The sketch below shows the graph of $f(x) = 2 \times a^x - 1$. The point $A(1; 5)$ is a point on the graph.



6.1 Show that $a = 3$. (2)

6.2 Determine the y-intercept of f. (2)

6.3 Write down the range of f. (1)

6.4 Determine $f(0{,}23)$, rounded off to three decimal places. (2)

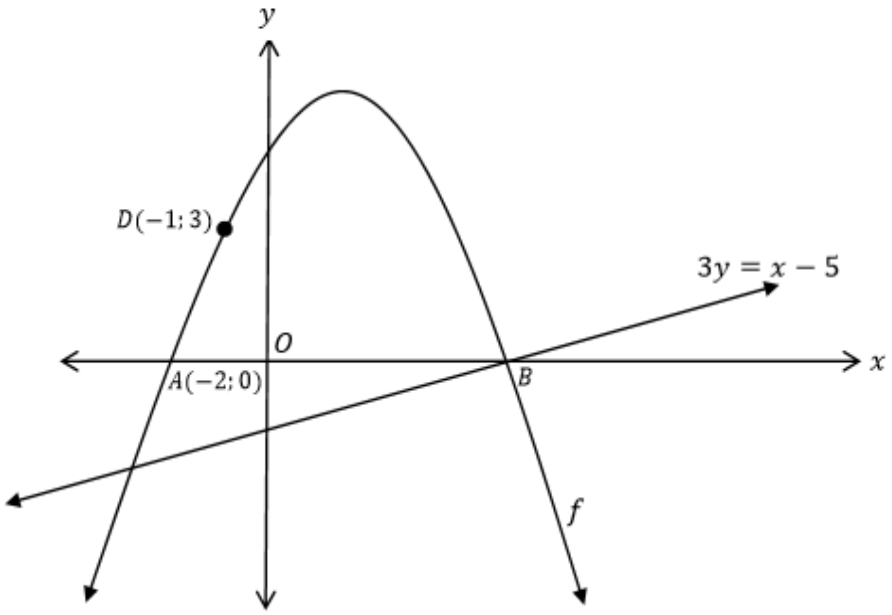
6.5 Determine the equation if f is reflected about the x-axis. (2)

[9]

QUESTION 7

The sketch below shows the graph of the function $f(x) = ax^2 + bx + c$.

The straight line with equation $3y = x - 5$ intersects f at B. The points $A(-2; 0)$ and B are the x-intercepts of f. Point $D(-1; 3)$ is a point on f.



7.1 Determine the coordinates of B. (2)

7.2 Determine the equation of f in the form $y = ax^2 + bx + c$. (4)

7.3 Determine the coordinates of the turning point of f. (3)

7.4 Point E is a point on the line $3y = x - 5$ so that DE is parallel to the y-axis. Determine the length of DE. (3)

7.5 For which value(s) of x is $x \times f(x) \geq 0$? (2)

[14]

Grade 11 Mathematics Paper 1 2016							
Name:					Maths Teacher:		
1	2	3	4	5	6	7	Total: 100
15 marks	25 marks	7 marks	12 marks	18 marks	9 marks	14 marks	

Diagram Sheet

Question 5.2