HILLCREST HIGH SCHOOL

MATHEMATICS PAPER 1

Grade 11 | November 2012

Time : 2 hours | Marks : 105

INSTRUCTIONS

1. This paper consists of 7 questions. Answer all questions.
2. Clearly show ALL calculations, diagrams, graphs etc that you have used in determining the answers.
3. A formula sheet is included at the end of the question paper.
4. If necessary , answers should be rounded off to TWO decimal places.
5. Number your answers exactly as the questions are numbered.
6. An approved scientific calculator may be used ,unless otherwise stated.
7. Diagrams are NOT necessarily drawn to scale.
8. A diagram sheet is provided for questions 6 and 7. Please write your name and your teacher's name on this sheet and place it in your answer book.

QUESTION 1

1.1 Solve for x (correct to 2 decimal places where necessary) :

1.1.1 $3x^2 + 8x + 4 = 0$ (3)

1.1.2 $x(1 - 3x) = -9$ (4)

1.1.3 $x^2 + 4x > 21$ (4)

1.2 Solve simultaneously for x and y in the following system of equations :

$$x + 2y = 3$$
$$x^2 + 3xy = 10$$

(6)

[17]

QUESTION 2

2.1 Zack invests an amount of R15000 for a 10 year period. For the first four years the interest was 9% p.a. compounded monthly and for the next six years the interest is calculated at 11% p.a. compounded quarterly.

2.1.1. Calculate the value of the investment after four years. (4)

2.1.2 What is the value of the investment at the end of the end of the ten years (4)

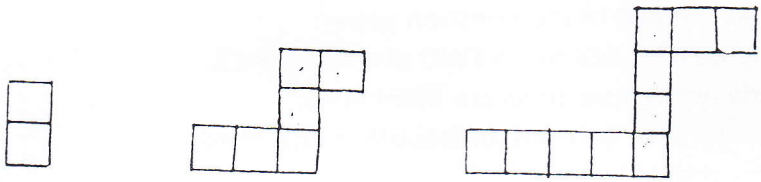
2.2 A motor bike that cost R28000 depreciated at 9% p.a. compounded annually. Calculate the market value after four years. (4)

2.3 Calculate the effective interest rate if the nominal interest rate is 8% p.a. compounded monthly. (4)

[16]

QUESTION 3

3.1



Group 1 Group 2 Group 3 Group 4 Group 5

3.1.1 How many squares are there in the 4^{th} and 5^{th} group ? (2)

3.1.2 Determine the formula for the general term. (2)

3.1.3 Which group will have 198 squares ? (3)

3.2 Given the sequence : 1; 5; 13; 25; .....

3.2.1 Identify the type of sequence (linear or quadratic) , giving a reason for your answer. (2)

3.2.2 Determine the formula for T_n (5)

3.2.3 Determine T_{50} (2)

[16]

QUESTION 4

4.1 Simplify, without using a calculator:

4.1.1 $\frac{4}{x} + \frac{6}{x-2}$ (3)

4.1.2 $\frac{9^{n-1}.27^{3-2n}}{81^{2-n}}$ (5)

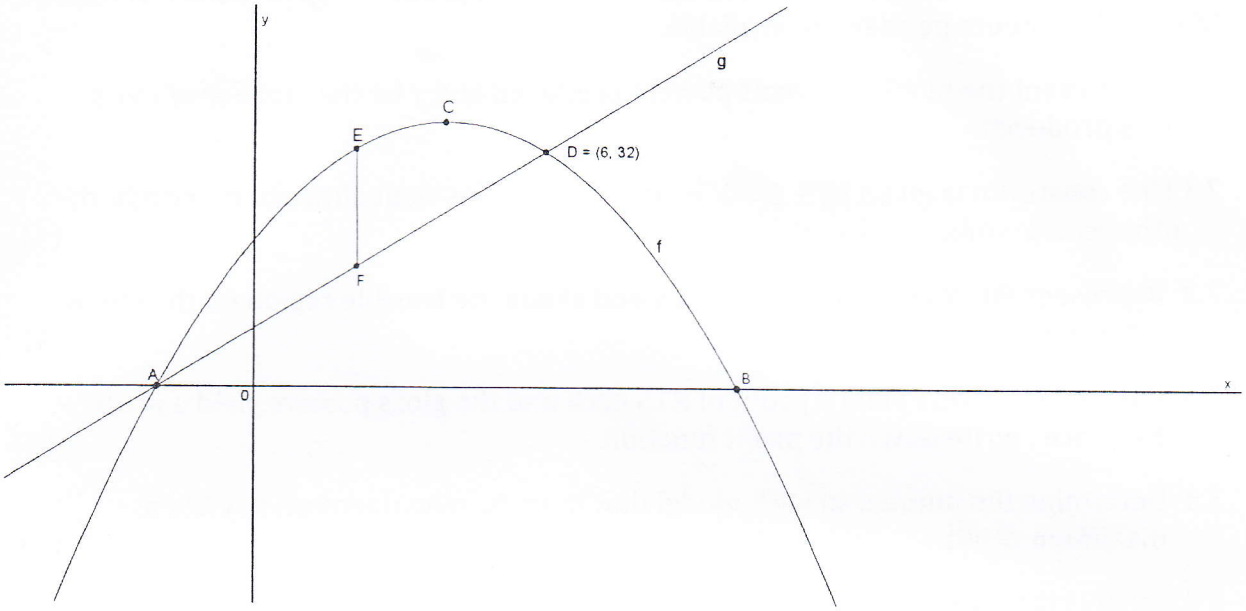
4.1.3 $\frac{2\sqrt{8} - \sqrt{50}}{(1-\sqrt{2})(1+\sqrt{2})}$ (4)

4.2 Solve for n : $5^n + 2.5^{n+1} = 55$ (4)

[20]

QUESTION 5

The sketch shows the graph of a parabola f and a straight line g. The points A and D(6; 32) are points of intersection of f and g. The points A and B are the x intercepts of the parabola defined by the equation $f(x) = -x^2 + 8x + 20$



5.1 Calculate the co-ordinates of point C, the turning point of the parabola. (3)

5.2 Calculate the co-ordinates of A (3)

5.3 Show that the equation of $g(x) = 4x + 8$ (4)

5.4 Show by calculation that the length of EF can be expressed as $-x^2 + 4X + 12$ (2)

[12]

QUESTION 6

Consider the function $f(x) = \frac{-1}{x-3} + 2$

6.1 Determine the y intercept of f (2)

6.2 Write down the equation of the asymptotes of f (2)

6.3 For what value(s) of x is $f(x) = 0$ (3)

6.4 Draw a neat sketch graph of f on the diagram sheet provided. (4)

[11]

QUESTION 7

A company produces two types of posters: matt posters and gloss posters. There is an expected demand of at most 60 matt posters and 40 gloss posters each day. Because of limitations on the production capacity, no more than 70 posters can be produced daily. It takes 5 hours to make a matt poster and 10 hours to produce a gloss poster. A total of 500 working hours per day are available.

Let x represent the number of matt posters produced and y be the number of gloss posters produced.

7.1 One constraint is given by $x \leq 60$. Write down all the inequalities to represent the other constraints. (4)

7.2 Represent the constraints graphically and shade the feasible region on the given set of axes. (4)

7.3 If the matt posters yield a profit of R15 each and the gloss posters yield a profit of R25 each , write down the profit function. (1)

7.4 Determine the number of each model that must be manufactured to yield a maximum profit (3)

7.5 What is the maximum profit ? (1)

[13]