GRADE 10 IEB STANDARDISATION PROJECT
NOVEMBER 2012

MATHEMATICS: PAPER I

Time: 2 hours 100 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 7 pages, an Information Sheet of 1 page and a Diagram Sheet of 1 page. Please check that your paper is complete.
2. Read the questions carefully.
3. Answer all the questions.
4. Question 7 must be answered on the Diagram Sheet.
5. Number your answers exactly as the questions are numbered.
6. You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.
7. Round off your answers to one decimal digit where necessary.
8. All the necessary working details must be clearly shown.
9. It is in your own interest to write legibly and to present your work neatly.

QUESTION 1

(a) Factorise fully:

(1) $3a^2 + 5a - 2$ (2)

(2) $x^3 + x^2 - 2x - 2$ (3)

(3) $\frac{a^2}{9}(3-b) + \frac{b^2}{16}(b-3)$ (4)

(b) Simplify:

$\frac{25^x - 1}{5^x + 1}$ (2)

[11]

QUESTION 2

(a) Solve for x:

(1) $x^2 - 2x = 15$ (2)

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

(3) $4^{x-1} = 8$ (4)

(b) Solve for x and y:

$x + 2y = 1$ and $2x + 3y = 6$ (5)

(c) Solve for x:

$-1 \leq 1 - 2x < 9$

and illustrate your solution on a number line. (5)

[21]

QUESTION 3

(a) Determine the 4^{th} and the n^{th} terms of the following number patterns:

(1) $-1;\ -8;\ -27;$ ..... (2)

(2) $3;\ 0;\ -3;$ ..... (3)

(b) Find the first two numbers in the sequence:

__; __; 4; 7; 12; 19; 28 (3)

(c) Determine between which two consecutive integers $\sqrt{18}$ lies, without using a calculator. (2)

(d) Find the product of:

$$\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right)\left(1-\frac{1}{6}\right)\left(1-\frac{1}{7}\right).....\left(1-\frac{1}{74}\right)\left(1-\frac{1}{75}\right)$$ (3)

[13]

QUESTION 4

(a) Simplify:

$$\frac{x^2-2x+1}{x-1}\ -\ \frac{x^2+x+1}{x^3-1};\ x\neq 1$$ (5)

(b) What must be added to x^2-x+4 to make it equal to $(x+2)^2$? (2)

[7]

QUESTION 5

There are two major factors that influence the price of petrol, namely the cost of importing crude oil and the rand/dollar exchange rate.

In South Africa in January 2012, the petrol price was R10,41 per litre at a time when crude oil cost $113,22 a barrel and the exchange rate was R7,56 to the US dollar.

(a) Calculate the percentage increase in the cost of crude oil if the price of oil increased to $150 a barrel. (3)

(b) Calculate the percentage increase in the cost of one dollar if the exchange rate changed to R9,20 to the US dollar. (3)

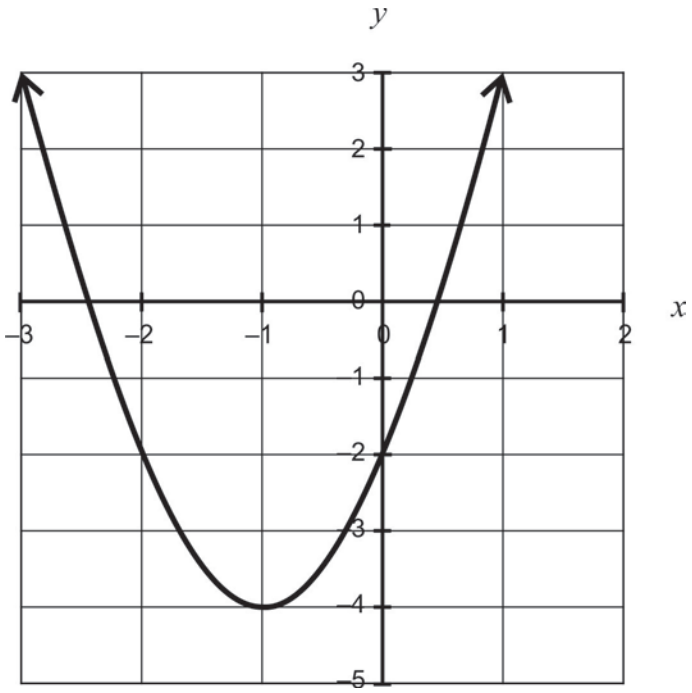
(c) Calculate the new petrol price based on the increase in (b). (3)

[9]

QUESTION 6

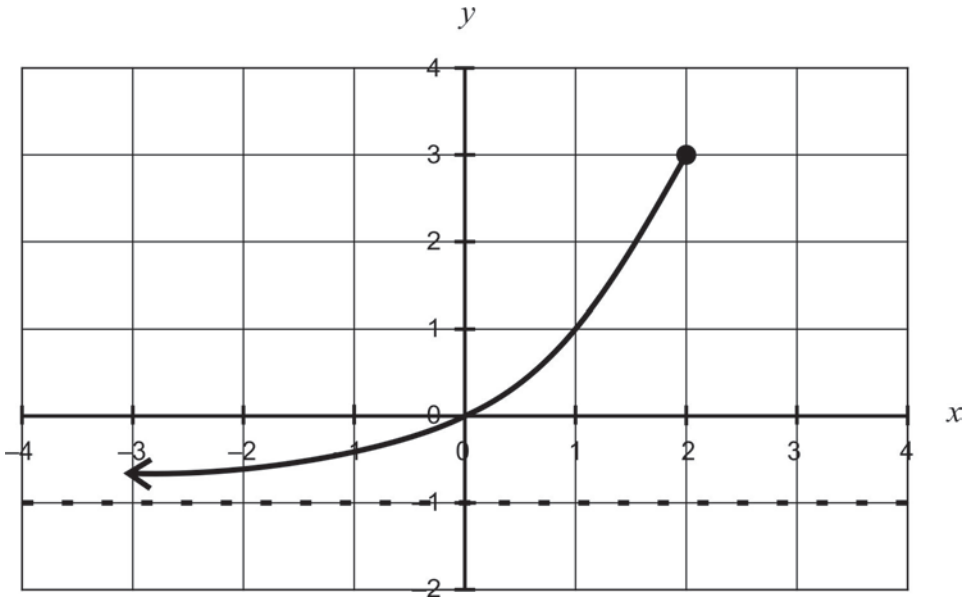
(a) Give the domain and range of the functions shown in each sketch.

(1)



(2)

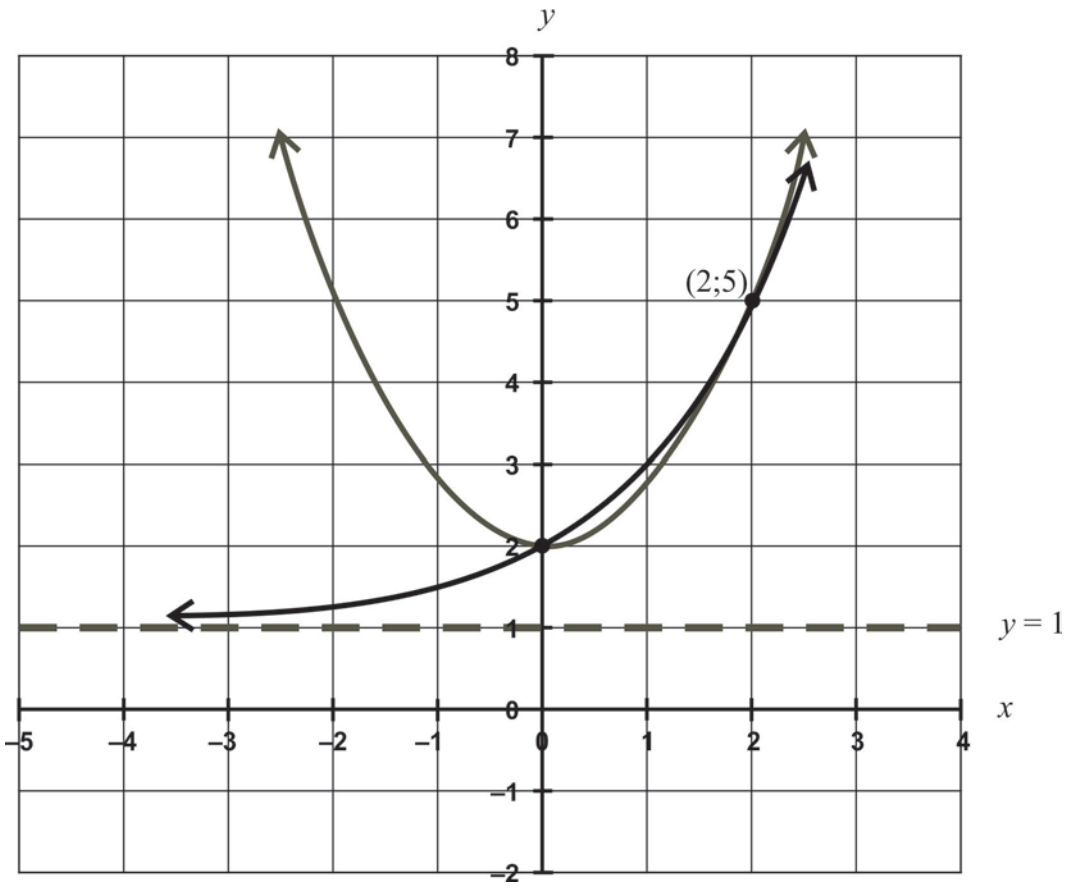
(2)



(2)

(b) Sketched below (drawn to scale) are the graphs of :

$f(x) = ax^2 + q$ and $g(x) = m^x + t$



(1) Determine the values of a, q, m and t. All working must be shown. (6)

(2) From your graph, determine the values of x for which $f(x) \leq g(x)$. (2)

[12]

QUESTION 7

Answer this question on the **Diagram Sheet** provided.

Given: $f(x) = \frac{12}{x} + 3$

(a) Sketch the graph of the given function $f(x)$ on the axes provided, indicating all intercepts with the axes and asymptotes. (5)

(b) Give the equation of the graph $g(x)$ that results when the graph of $f(x)$ is shifted down 5 units, in the form $g(x) = ...$ (2)

[7]

QUESTION 8

In the Australian Open 2012, Novak Djokovic made history when he beat Rafael Nadal in the longest Open tennis final – 5 hours, 53 minutes!

Djokovic hit a return shot from Nadal at match point.

The height (h) of the ball above the ground is given by $h(t) = -3t^2 + 6t + 3$, where t is time in seconds and h is measured in metres.

(a) Calculate the height of the ball above the ground when $t = 2$ seconds. (2)

(b) After how many seconds does the ball reach a height of 6 metres? (4)
[6]

QUESTION 9

(a) A survey was done with 150 customers in a store to determine the number of homes with DSTV and DVD players.

The following results were obtained:

- 125 have DSTV
- 85 have DVD players
- 70 have both DSTV and DVD players

Let T represent the number with DSTV and V represent the number with DVD players.

(1) Calculate $n(T \text{ or } V)$. (3)

(2) Draw a Venn diagram to illustrate the information. (4)

(3) Determine the probability that a randomly chosen customer who was questioned had:

(i) a DVD player. (1)

(ii) a DVD player but no DSTV. (1)

(iii) neither DSTV nor a DVD player. (1)

(b) Melissa sits on the beach and writes her name over and over again in the sand:

MELISSAMELISSA …….

(1) If Melissa continues this pattern, determine the 2012^{th} letter she will write. (2)

(2) Determine the probability of the letter 'M' being selected out of the 2012 letters. Leave your answer as a fraction in its simplest form. (2)

[14]

Total: 100 marks