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YOUR NAME:

YOUR TEACHER:

GRANTLEIGH



PRELIMINARY EXAMINATION 2015

GRADE 12 MATHEMATICS PAPER 1

TIME: 3 HOURS

MARKS: 150

EXAMINER: S. Dzingwa

MODERATORS: H. Botes

M. Phungula

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. Write your name on top of this front page.
2. This question paper consists of 20 pages and a separate Information Sheet.
3. Answer ALL the questions on this question paper.
4. Diagrams are not drawn to scale.
5. You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.
6. Round off your answers to one decimal digit where necessary.
7. All the necessary working details must be clearly shown.
8. It is in your own interest to write legibly and to present your work neatly.

DO NOT WRITE IN THIS GRID

QUE 1	QUE 2	QUE 3	QUE 4	QUE 5	QUE 6	QUE 7	QUE 8	QUE 9	TOTAL

SECTION A

QUESTION 1

a) Solve for x :

1) $2x^2 + 9x = 5$ (3)

2) $x^2 < 4$ (3)

3) $\log_3(x-4) = 1$ (2)

4) $\sqrt{3x+10} - 2 = x$ (6)

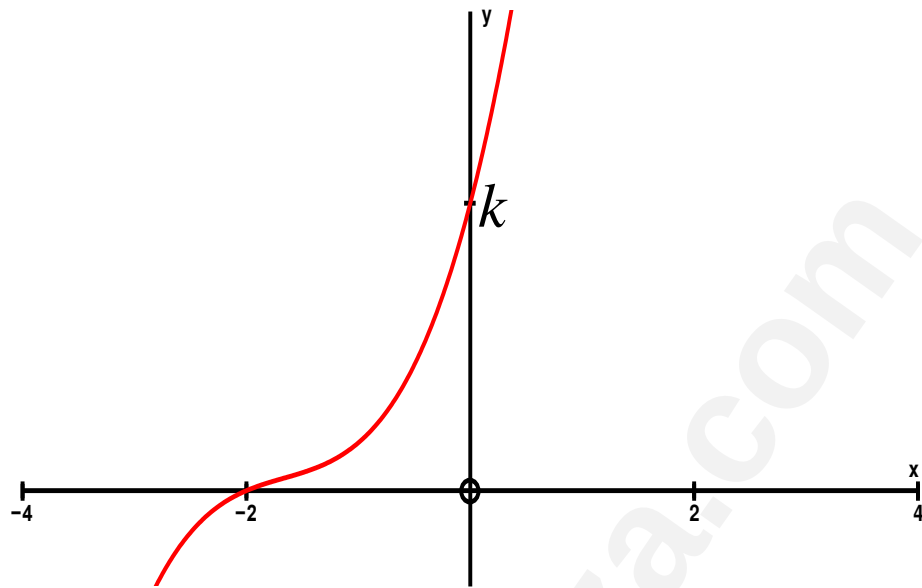
5) $7^{5x} = 1$ (2)

b) Solve for x and y simultaneously if

$$y-2x+1=0 \text{ and } xy=2y+x^2+3x-10 \quad (7)$$

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c) A sketch of $y = x^3 + 5x^2 + 9x + k$ where k is an integer, is shown.



Work out the value of k . (3)

d) If $y = 2x^3 - 5x$, work out $\frac{dy}{dx}$. (2)

[28]

QUESTION 2

a) Given the sequence: $7; 3; -1; \dots$

- 1) Write down the next term of the sequence, if the sequence behaves consistently. (1)

- 2) Find the general term, T_n , of the sequence. (2)

- 3) What is the value of T_{300} ? (1)

- 4) Which term of the sequence is -233 ? (2)

b) Given: $T_n = 2^{1-n}$

- 1) Write down the first TWO terms of the sequence. (2)

- 2) Determine S_4 of the sequence. (2)

c) The number pattern 8 ; 20 ; 38 ; 62 ; ... is such that the sequence of 'second difference' is a constant.

- 1) Write down the fifth term of the number pattern. _____ (1)

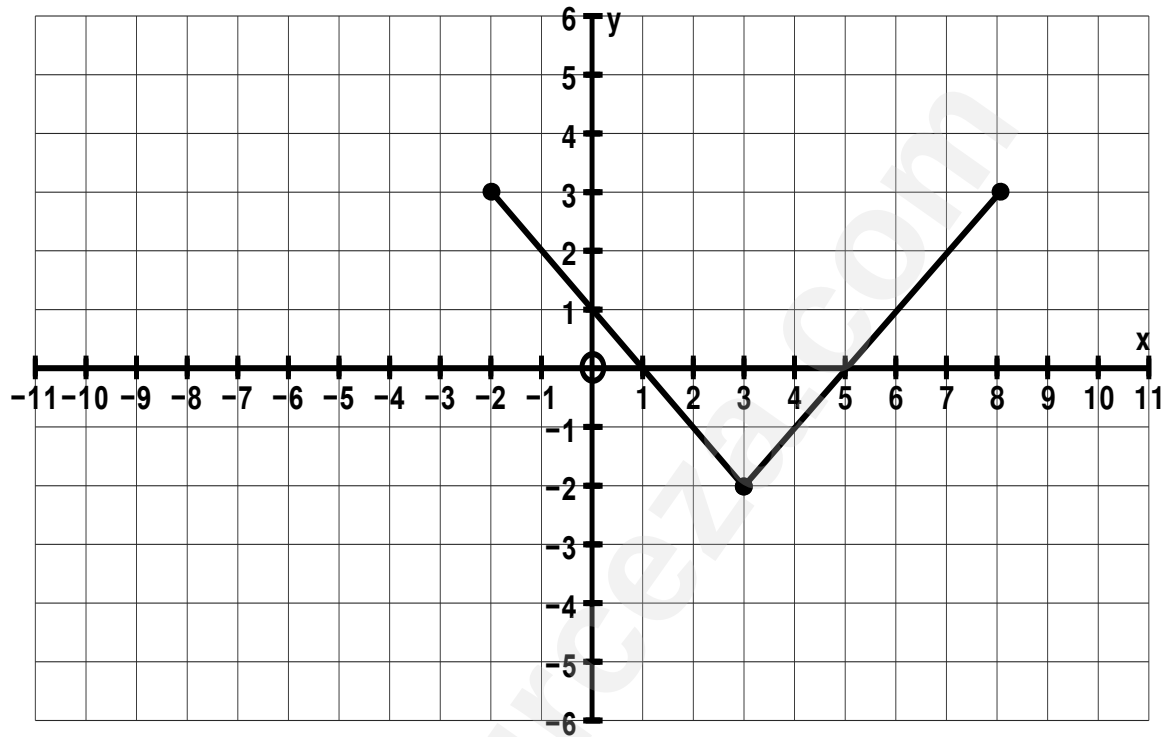
- 2) Determine SIMPLIFIED algebraic expression for the n^{th} term of the number pattern. (6)

[illegible]

[17]

QUESTION 3

a) A function $y = f(x)$ is shown on the sketch below.



On the same system of axes above sketch the function $g(x) = f(x+2)+3$ (3)

b) Point $A(-6;10)$ is the turning point of a function $y = f(x)$. What will be the turning point of a function:

1) $y = 2f(x)$ _____ (2)

2) $y = f(-x)$ _____ (2)

c) Given $f(x) = 3x^2$

1) Give the domain and range of f . (3)

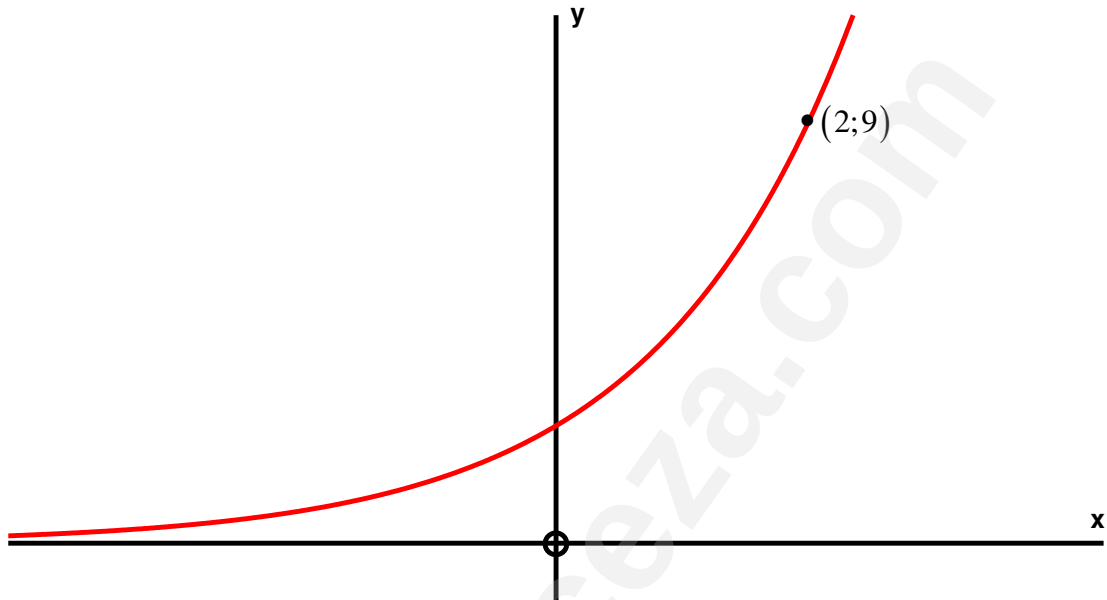
2) Give the domain of the inverse of f . (1)

3) Restrict the domain of f so that its inverse is a function. (1)

[12]

QUESTION 4

The figure represents the graph of $f(x) = a^x$.



- a) If the point (2 ; 9) lies on the graph above, determine the value of a . (2)

- b) Determine the equation of f^{-1} in the form $f^{-1}(x) = \dots$ (2)

- c) Determine the equation of $i(x)$, which is $f^{-1}(x)$ reflected about the y-axis. (2)

[6]

QUESTION 5

- a) If $f(x) = -x^2$, determine $f'(x)$ by using **first principles**. (5)

- b) Determine $f'(x)$ if :

1) $f(x) = \frac{x^2 - 9}{x - 3}$ (3)

2) $f(x) = \sqrt{x} \left(x + \frac{1}{x} \right)$

Write your answer with positive exponents. (5)

[13]

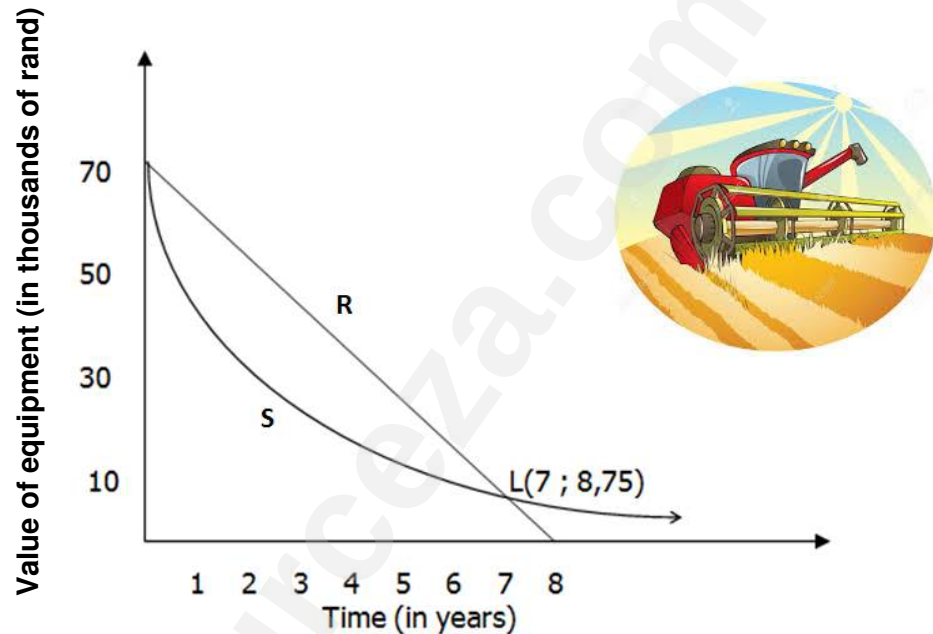
76 MARKS

SECTION B

QUESTION 6

- a) The diagram below displays two methods of depreciation for farming equipment.

Point $L(7; 8,75)$ is the intersection of line R and curve S.



- 1) What was the initial value of the equipment? (2)

- 2) What type of decrease does Method R illustrate? (1)

- 3) The other method used is: $A = P(1 - i)^n$.
 Determine the rate of depreciation using the above formula. (4)

- b) Mary invests R8 000 at 12% per annum compounded monthly for the first 3 years and 15% per annum compounded quarterly for the next 2 years. How much will Mary receive in total after 5 years? (4)

- c) Gavin invests R90 000. He is quoted a nominal interest rate of 7,6% per annum compounded monthly.

- 1) Calculate the effective rate per annum, as a percentage, correct to TWO decimal places. (2)

- 2) Use the effective rate to calculate the value of Gavin's investment if he invested the money for 3 years. (2)

- d) A company owner calculated that he should set up a sinking fund of R540 000 so that he can replace computers in 7 years' time.

Calculate the monthly payment, from next month, needed if the bank offers him interest at 7,2% p.a. compounded monthly. (5)

[20]

QUESTION 7

- a) If $S_n = 2n^2 + 3n$ determine the value of the 15th term. (3)

- b) The 5th, 6th and 7th terms of an arithmetic sequence are $2x - 1$, $x + 4$ and $2x + 1$ respectively. Determine the values of the first three terms of the sequence. (6)

- c) Find the values of x if the series $(2x+3)^2 + (2x+3)^3 + (2x+3)^4 + \dots$ converges. (3)

(6)

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[18]

QUESTION 8

- a) If $f(x) = \frac{3^x}{5} + 1$, determine the inverse of f , in the form $f^{-1}(x) = \dots$ (4)

- b) If $\log 2 = p$ and $\log 3 = t$ determine $\log 15$ in terms of p and t . (5)

- c) Without using a calculator, evaluate:

$$\log \frac{1}{2} + \log \frac{2}{3} + \log \frac{3}{4} + \dots + \log \frac{999}{1000} \quad (5)$$

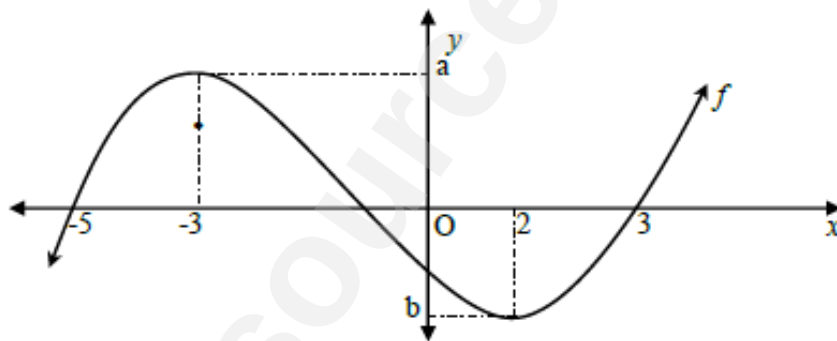
[14]

QUESTION 9

- a) The cubic function $f(x) = ax^3 + bx^2 + cx + d$ has a point of inflection when $x = p$.

Show that $p = -\frac{b}{3a}$. (4)

- b) Part of the graph $f(x) = ax^3 + bx^2 + cx + d$ is shown below.



- 1) For which values of x is $f'(x) = 0$? (2)

- 2) For which values of x is $f'(x) > 0$? (4)

- 3) On the same system of axes above draw the sketch of the derivative $f'(x)$ indicating only the x – intercepts of the graph. (3)

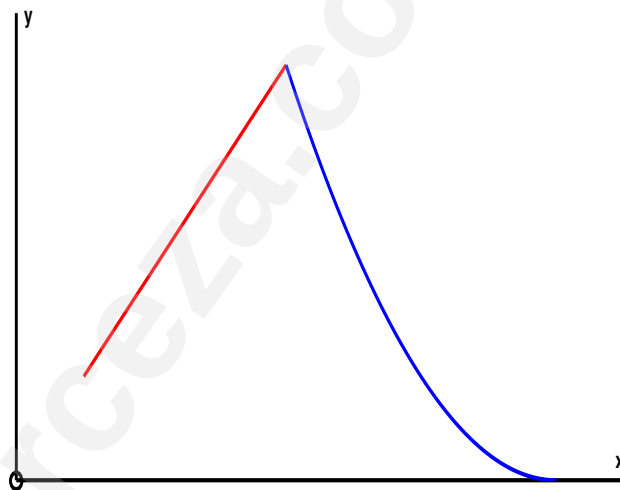
- 4) What is the maximum number of solutions the equation $f(x) = f''(x)$ will have? Justify your answer. (4)

- c) Water is pumped into a tank at a constant rate.
 Pumping stops at the end of the fourth day.

At this time a valve is opened and water flows from the tank at a decreasing rate. After the valve is opened, the volume of water in the tank, until it is empty, can be modelled by a parabola.

The volume (in litres) of water in the tank at the end of each eight days is shown in the following table and the graph below.

Day(D)	Litres (V)
1	2000
2	4000
3	6000
4	8000
5	4500
6	2000
7	500
8	0



Calculate the volume of water left in the tank after six and a half days. (4)

[22]

74 MARKS

TOTAL: 150 MARKS

*******END*******