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BALLITO

Mathematics**Paper 1****FORM 5****1 September 2020****TIME: 3 hours****TOTAL: 150 marks****Examiner: Miss Eastes****Moderated: Mrs. Gunning****NAME:**

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE ANSWERING THE QUESTIONS.

- This question paper consists of 13 questions, 20 pages, plus an information sheet.
- Answer all questions on this question paper.
- Read and answer all questions carefully. Write legibly and present your work neatly.
- All necessary working which you have used in determining your answers **must** be clearly shown.
- Approved non-programmable calculators may be used except where otherwise stated. Where necessary give answers correct to **1 decimal place** unless otherwise stated.
- Ensure that your calculator is in DEGREE mode.
- Diagrams have not necessarily been drawn to scale.

Question	1	2	3	4	5	6	7	8	9	10	11	12	13
Mark													
Out of	23	11	13	11	17	8	8	6	10	21	8	6	8
Total (150)								Percentage					

QUESTION 1

- a) Simplify the following without the use of a calculator:

$$\frac{2^{2p+2} - 3 \cdot 2^{2p+2}}{4^p + 3 \cdot 4^{p+1}} \quad (5)$$

- b) Solve for x :

$$\sqrt{x+2} + 2x = 0 \quad (5)$$

c) If $g(a) = \frac{\sqrt{a+2}}{16-a^2}$ determine the values of a for which:

(4)

(5)

(4)

$$x = \frac{-b \pm \sqrt{16b^2 + 9b^2}}{2a}$$

[23]

QUESTION 2

a) Given the geometric series:

$$6 + 3 + \frac{3}{2} + \frac{3}{4} + \dots$$

1) Calculate the value of the 11th term. (3)

2) Find the sum of the first eleven terms of the series. (3)

b) The twelfth term of an arithmetic sequence is 5, and the common difference between successive terms is 3. Determine which term has a value of 47. (5)

[11]

QUESTION 3

An agricultural organisation assists farmers by arranging loans at very low interest rates.



[Source: <www.irrigation-uk.com>]

A farmer purchased irrigation equipment of R2 500 000. The organisation offered him a loan for the full amount of 6% per annum compounded quarterly.

- a) Show that his quarterly instalment, if the loan repayment period was 5 years, is R 145 614,34. (3)

- b) How long would his load period be in years, if he repaid R100 000 each quarter instead of R 145 614,34. (3)

- c) Calculate the outstanding balance of the loan after 4 years, i.e. immediately after the 16th payment. (with his quarterly payment being: R 145 614,34) (3)

- d) Calculate the total amount paid towards the interest charges over the 4-year period. (4)

[13]

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QUESTION 4

- a) Determine $f'(x)$ using first principles if $f(x) = 2x^2 - 3x$ (5)

- b) Determine $\frac{dy}{dx}$ if $y = \frac{\sqrt{x^3-5x^2+6}}{x^4}$ (Leave your answer with positive exponents) (6)

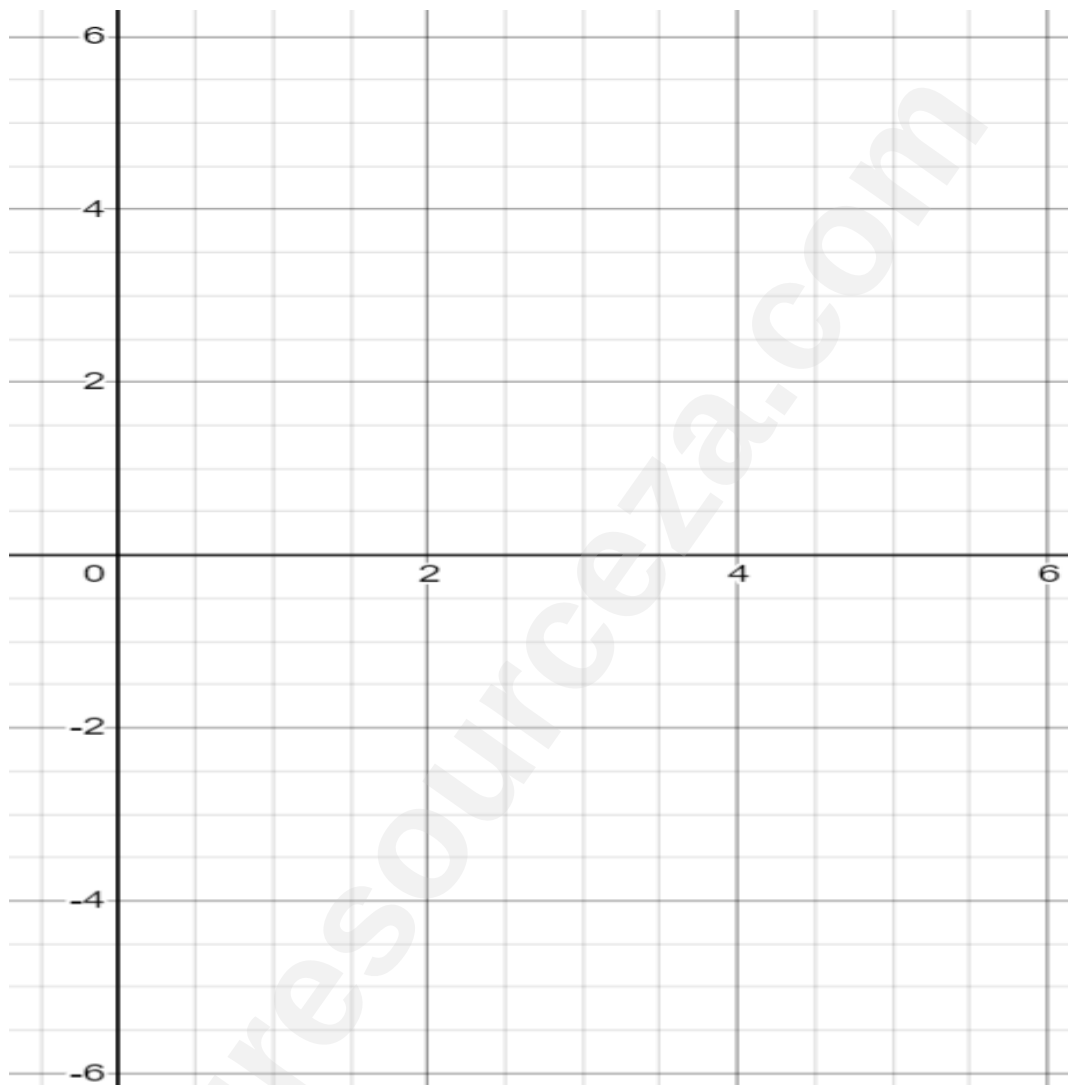
[11]

QUESTION 5

Given that $g(x) = \log_2 x$ for $x > 0$ and $f(x) = \frac{2}{x-2}$ for $x > 0$

- a) Draw the graphs of $g(x)$ and $f(x)$ on the axes provided below.
Show all intercepts with the axes and asymptotes where applicable.
Give at least 2 coordinates on each graph.

(7)



- b) Determine the equation of $g^{-1}(x)$.

(2)

c) Give the new equation $h(x)$ if $f(x)$ is shifted 3 units up and 2 units left (2)

d) Give the axes of symmetry of $f(x)$. (2)

e) For which x values will $g(x) \leq 0$ (2)

f) Give the domain of $f(x)$ (2)

[17]

$(k - 4); (k + 1); m; 5k$ is a set 4 numbers,

- b) If the last three terms form a geometric sequence, write an equation in terms of m and k using the common ratio. (2)

- c) Find k and m if both are positive (4)

QUESTION 7

Find p if:

(8)

$$\sum_{k=1}^{\infty} 27p^k = \sum_{t=1}^{12} 24 - 3t \quad \text{and} \quad -1 < p < 1$$

[8]

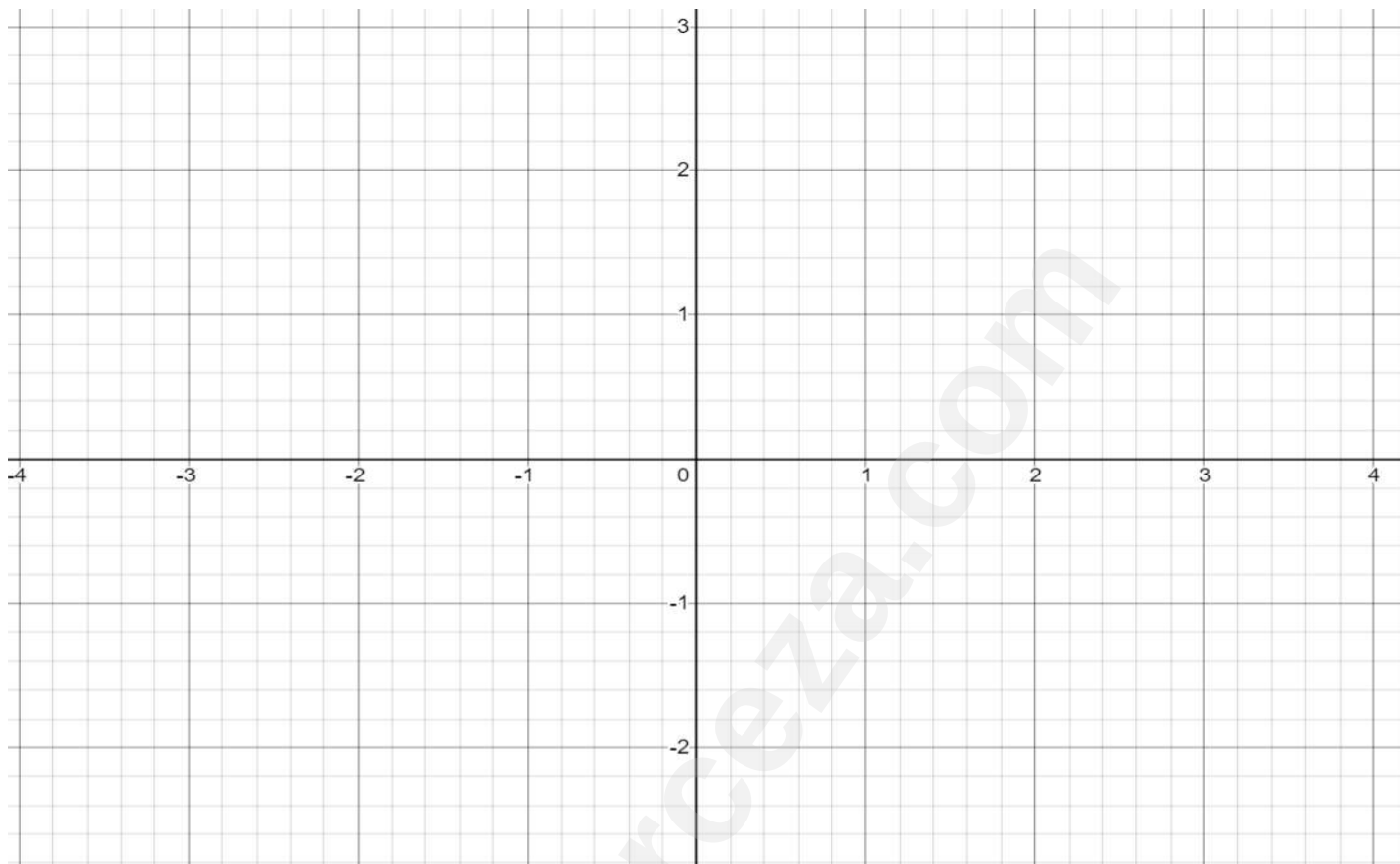
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[illegible]

[6]

QUESTION 9

- a) Sketch the graph of $g(x) = -x^2 + 1$. Indicate all intercepts with the axes. (3)



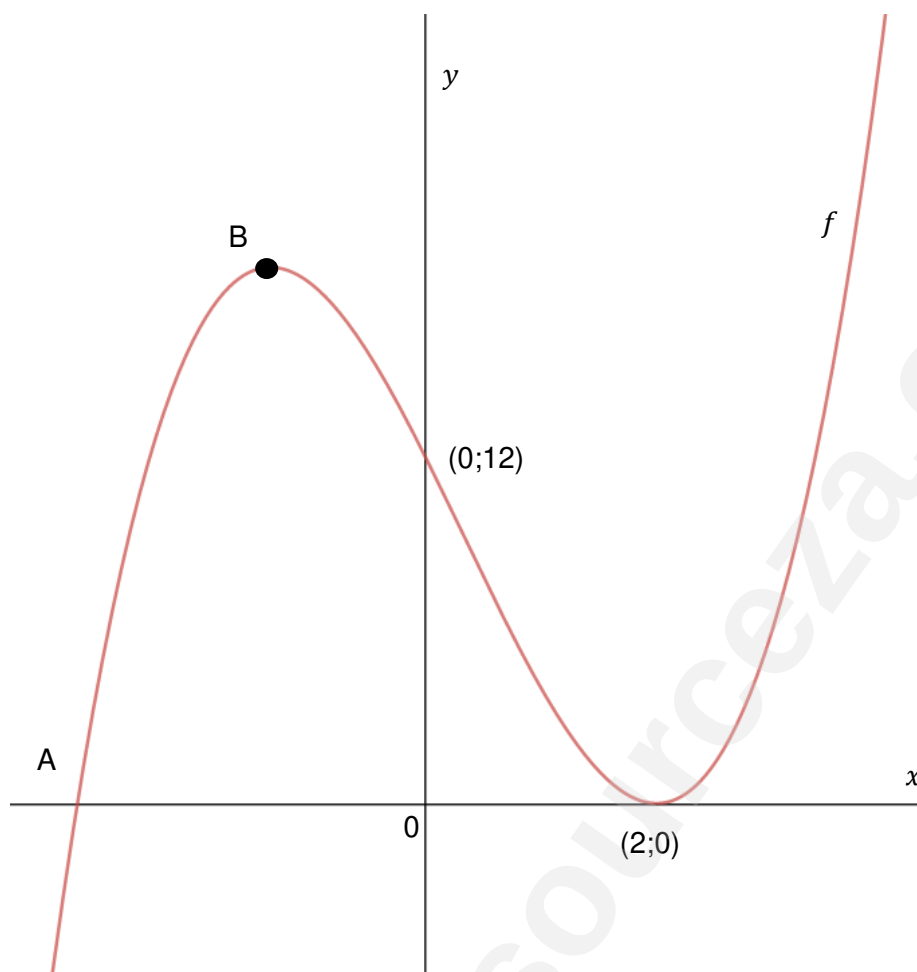
- b) Find the equation $g^{-1}(x)$. (4)

- c) Sketch the graph of $g^{-1}(x)$ on the axes provided above. (3)

[10]

QUESTION 10

Given the following graph $f(x) = x^3 + bx^2 + cx + 12$ with a y-intercept of $(0; 12)$ and an x-intercept and turning point at $(2; 0)$, turning point B and x-intercept A.



a) Prove that the value of $b = -1$ and $c = -8$

(7)

b) Write the values of x for which $f'(x) > 0$ (4)

c) For which values of k will the equation $x^3 - x^2 - x + 12 = k$ have 3 real roots? (3)

d) For which values of x will $f(x)$ be concave down? (4)

e) Draw the graph of $f'(x)$ on the axes above (3)

[21]

QUESTION 12

The word **REINSTATED** is given.

- a) Using all the letters, how many unique arrangements can be made?

Leave your answer in factorial form.

(3)

- b) If a 6-lettered word is made, how many unique words start with the letter T?

Simplify your answer.

(3)

[6]

QUESTION 13

A shelf (A) contains 12 books on fiction and a certain amount of non-fiction.

Another shelf (B) has a certain amount of books on fiction and 10 on non-fiction.

The probability of **choosing a non-fiction book from shelf A is 0,25**

The probability of **choosing two fiction books in a row (one from book shelf A and one from book shelf B) is 0,5.**

How many books in shelf A are on non-fiction and how many books in shelf B are on fiction?

(8)

[8]

EXTRA PAGE FOR WORKING

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