

## MATHEMATICS

PAPER 1 | GRADE 12 | 2024

Time: 3 hours

Total: 150 marks

Language: English

This paper is for PRACTICE purposes only. Not an official Department of Basic Education paper.

## INSTRUCTIONS AND INFORMATION

1. This question paper consists of 7 questions.

2. Answer A

## QUESTION 1: Algebra and Equations

[30 marks]

1.1 Solve for x:

(a)  $x^2 - 5x + 6 = 0$

(3)

Answer:

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1.2 Solve for x:

$2x^2 - 3x - 2 = 0$  (correct to TWO decimal places)

(4)

Answer:

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1.3 Solve for x and y simultaneously:

$x + y = 5$  and  $x^2 - xy + y^2 = 7$

(6)

Answer:

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**1.4**     Given:  $f(x) = -x^2 + 4x + 5$   
            (a) Determine the x-intercepts of f. **(3)**

Answer:

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**1.5**     (b) Determine the turning point of f. **(3)**

Answer:

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**1.6**     (c) Write down the range of f. **(2)**

Answer:

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**1.7**     Simplify:  $(2^{(n+1)} - 2^n) / (2^{(n-1)})$  **(4)**

Answer:

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**1.8**     Solve for x:  $\log_2(x) + \log_2(x-2) = 3$  **(5)**

Answer:

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**TOTAL FOR THIS QUESTION:     30**

**QUESTION 2: Number Patterns, Sequences and Series**

**[25 marks]**

**2.1**     The first three terms of an arithmetic sequence are:  $2k+3$  ;  $3k-2$  ;  $18-k$   
            (a) Determine the value of k. **(4)**

Answer:

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**2.2**     (b) Write down the first THREE terms of the sequence. **(2)**

Answer:

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**2.3** (c) Calculate the 20th term of this sequence. **(3)**

Answer:

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**2.4** The sum of the first  $n$  terms of a geometric series is given by  $S_n = 3(2^n - 1)$ .  
(a) Determine the first term of the series. **(3)**

Answer:

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**2.5** (b) Determine the common ratio. **(2)**

Answer:

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**2.6** (c) Determine the 6th term. **(3)**

Answer:

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**2.7** Calculate the sum to infinity of the geometric series:  $18 + 6 + 2 + \dots$  **(4)**

Answer:

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**2.8** Write in sigma notation and calculate:  $3 + 7 + 11 + \dots + 39$  **(4)**

Answer:

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**TOTAL FOR THIS QUESTION: 25**

**QUESTION 3: Functions and Inverse Functions** **[35 marks]**

**3.1** The graph of  $f(x) = a \cdot x^2 + q$  passes through (0, -3) and (1, 1).  
(a) Show that  $a = 4$  and  $q = -3$ . **(4)**

Answer:

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**3.2** (b) Write down the equation of the axis of symmetry of  $f$ . **(1)**

Answer:

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**3.3** (c) Determine the range of  $f$ . **(2)**

Answer:

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**3.4** (d) Write down the coordinates of the turning point of  $f$ . **(2)**

Answer:

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**3.5** Given:  $g(x) = 2^x$   
(a) Write down the domain and range of  $g$ . **(2)**

Answer:

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**3.6** (b) Determine the equation of  $g^{-1}(x)$  (the inverse of  $g$ ). **(2)**

Answer:

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**3.7** (c) Is  $g^{-1}$  a function? Give a reason. **(2)**

Answer:

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**3.8** Given  $h(x) = \frac{3}{(x-2)} + 1$   
(a) Determine the equations of the asymptotes. **(2)**

Answer:

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**3.9** (b) Write down the domain of  $h$ . **(1)**

Answer:

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**3.10** (c) Determine the x- and y-intercepts of h. (4)

Answer:

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**3.11** The function  $p(x) = 3^{x-1} - 9$ . Determine the x-intercept of p. (3)

Answer:

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**3.12** Sketch the graph of  $f(x) = -2^{x+1} + 4$  showing all intercepts and asymptote. (4)

Sketch here:

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**3.13** The graph of f is reflected about the y-axis. Write the equation of the new graph. (2)

Answer:

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**3.14** For which values of x is  $f(x) \geq 0$ ? (2)

Answer:

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**TOTAL FOR THIS QUESTION: 35**

**QUESTION 4: Finance, Growth and Decay**

**[25 marks]**

**4.1** Sipho invests R15 000 at 8,5% per annum, compounded quarterly.  
Calculate the value of his investment after 6 years. (4)

Answer:

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**4.2** Determine the effective annual interest rate equivalent to 12% p.a. compounded monthly. (4)

Answer:

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**4.3** A car is bought for R280 000. It depreciates at 18% p.a. on a reducing balance.  
(a) Determine the book value after 5 years. (3)

Answer:

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**4.4** (b) After how many years will the car's value first fall below R80 000? (4)

Answer:

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**4.5** Lebo wants to save R500 000 in 10 years by making equal monthly deposits into an account earning 9% p.a. compounded monthly. Calculate the monthly deposit. (5)

Answer:

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**4.6** A loan of R180 000 is repaid over 20 years with monthly payments at 11,5% p.a. compounded monthly. Calculate the monthly repayment. (5)

Answer:

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**TOTAL FOR THIS QUESTION: 25**

**QUESTION 5: Differential Calculus** [35 marks]

**5.1** Determine  $\frac{dy}{dx}$  from FIRST PRINCIPLES if  $f(x) = 3x^2 - x$ . (6)

Answer:

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**5.2** Determine the following derivatives (do NOT use first principles):  
(a)  $f(x) = 4x^3 - (2/x^2) + \sqrt{x}$  (4)

Answer:

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**5.3** (b)  $g(x) = (x^2 - 1)(x + 3)$  (3)

Answer:

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**5.4** (c)  $h(x) = (3x^2 - x) / x, x \neq 0$  (3)

Answer:

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**5.5** The function  $f(x) = x^3 - 3x^2 - 9x + 27$   
(a) Determine the x-intercepts of f. (5)

Answer:

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**5.6** (b) Find the coordinates of the turning points of f. (5)

Answer:

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**5.7** (c) For which values of  $x$  is  $f$  concave up? **(3)**

Answer:

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**5.8** (d) Sketch the graph of  $f$ , clearly showing all intercepts and turning points. **(4)**

Sketch here:

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**5.9** A rectangular box with a square base has a volume of  $256 \text{ cm}^3$ . Show that the surface area is  $S(x) = 2x^2 + 1024/x$  and hence determine the dimensions for minimum surface area. **(6)**

Answer:

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**TOTAL FOR THIS QUESTION: 35**