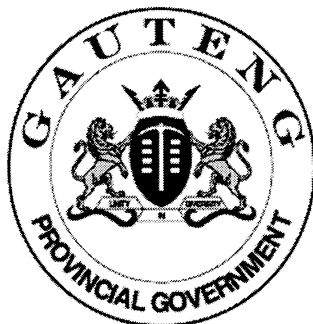


**SENIOR CERTIFICATE  
EXAMINATION  
SENIORSERTIFIKAAT-EKSAMEN**



**FEBRUARY / FEBRUARIE  
MARCH / MAART**

**2005**

**FUNCTIONAL MATHEMATICS**

***FUNKSIONELE  
WISKUNDE***

**SG**

**303-2/1**

FUNCTIONAL MATHEMATICS SG: Paper 1



303 2 1

SG

**7 pages  
7 bladsye**

**X05**



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GAUTENGSE DEPARTEMENT VAN ONDERWYS

SENIORSERTIFIKAAT-EKSAMEN

FUNKSIONELE WISKUNDE SG  
(Eerste Vraestel: Algebra)

TYD: 3 uur

PUNTE: 150

**INSTRUKSIES:**

- Beantwoord ALLE vrae.
- Alle toepaslike bewerkings moet getoon word.
- Sakrekenaars mag gebruik word, tensy anders vermeld.
- Finale antwoorde moet tot TWEE desimale syfers afgerond word, tensy anders aangedui.
- Raadpleeg die inligtingsblad op bladsy 6.
- 'n Vel grafiekpapier word ingesluit aan die einde van die vraestel. Gebruik dit om Vraag 5 te beantwoord.

**QUESTION 1**

Gebruik die toepaslike formules om die vrae hieronder te beantwoord.

$$T_n = a + (n - 1) d$$

$$S_n = \frac{n}{2} [2a + (n - 1) d]$$

- 1.1 In die rekenkundige ry  $3x - 1$ ,  $x + 2$ , en  $x - 1$
- 1.1.1 bewys  $x = 3$ . (5)
- 1.1.2 bepaal die eerste drie terme. (3)
- 1.1.3 bepaal die gemene verskil. (1)
- 1.2 In die rekenkundige ry  $-7$ ;  $-12$ ;  $-17$  .....
- 1.2.1 bepaal die dertigste term. (3)
- 1.2.2 bereken die som van die eerste twaalf terme. (6)
- 1.3 Die algemene term is  $T_n = 6n - 7$ . Bepaal die agtste term van die ry. (3)
- 1.4 Watter term van die ry  $7$ ;  $9$ ;  $11$  .... is gelyk aan  $41$ ? (5)

**[26]**

**GAUTENG DEPARTMENT OF EDUCATION**  
**SENIOR CERTIFICATE EXAMINATION**

**FUNCTIONAL MATHEMATICS SG**  
**(First Paper: Algebra)**

**TIME: 3 hours**

**MARKS: 150**

**INSTRUCTIONS:**

- Answer ALL questions.
- All relevant calculations must be shown.
- Pocket calculators may be used, unless otherwise stated.
- Final answers must be rounded off to TWO decimal digits, unless otherwise stated.
- Consult the information sheet on page 6.
- A sheet of graph paper is provided at the back of the question paper. Use it to answer Question 5.

**QUESTION 1**

Use the relevant formulas to answer the questions below.

$$T_n = a + (n - 1) d$$

$$S_n = \frac{n}{2} [2a + (n - 1) d]$$

- 1.1 In the arithmetic sequence  $3x - 1$ ,  $x + 2$ , and  $x - 1$
- 1.1.1 prove  $x = 3$ . (5)
- 1.1.2 determine the first three terms. (3)
- 1.1.3 calculate the common difference. (1)
- 1.2 In the arithmetic sequence  $-7$ ;  $-12$ ;  $-17$  .....
- 1.2.1 determine the thirtieth term. (3)
- 1.2.2 calculate the sum of the first twelve terms. (6)
- 1.3 The general term is  $T_n = 6n - 7$ . Calculate the eighth term of the sequence. (3)
- 1.4 Which term of the sequence  $7$ ;  $9$ ;  $11$  .... is equal to  $41$ ? (5)

**[26]**

### VRAAG 2

Gebruik die toepaslike formules om vrae te beantwoord.

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

- 2.1 Die agtste term is 448 en die vierde term is 28.
- 2.1.1 Bewys dat die konstante verhouding 2 is.
- 2.1.2 Bepaal die eerste drie terme. (8)
- 2.2 Bepaal die som van die eerste ses terme van die reeks  $4 + 12 + 36 + \dots$  (4)
- 2.3 Watter term van die reeks  $4; 8; 16 + \dots$  is 128? (6)
- 2.4 Die algemene term is  $T_n = \frac{1}{8}(2)^{n-1}$ . Bepaal die sewende term. (3)
- [21]**

### VRAAG 3

- 3.1 Vereenvoudig sonder die gebruik van 'n sakrekenaar:
- 3.1.1  $\frac{32^{\frac{2}{5}} \cdot 8^{-\frac{2}{3}}}{81^{\frac{3}{4}}}$  (8)
- 3.1.2  $\frac{2^{x-1} \cdot 8^{x-2}}{16^{x-1}}$  (5)
- 3.1.3  $\sqrt{75} - \sqrt{27} + 2\sqrt{12}$  (5)
- 3.2 Los op vir  $x$  sonder om 'n sakrekenaar te gebruik:
- 3.2.1  $4^{2x} = 8^{3x-5}$  (4)
- 3.2.2  $\frac{1}{2}x^{\frac{1}{3}} = 2$  (3)
- [25]**

### QUESTION 2

Use the relevant formulas to answer the questions below.

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

- 2.1 The eighth term is 448 and the fourth term is 28.
- 2.1.1 Prove that the constant ratio is 2.
- 2.1.2 Determine the first three terms. (8)
- 2.2 Determine the sum of the six terms of the sequence 4 + 12 + 36 ..... (4)
- 2.3 Which term in the sequence 4; 8; 16 ..... is 128? (6)
- 2.4 The general term is  $T_n = \frac{1}{8} (2)^{n-1}$ . Determine the seventh term. (3)
- [21]**

### QUESTION 3

- 3.1 Simplify the following without the use of a calculator.
- 3.1.1  $\frac{32^{\frac{2}{5}} \cdot 8^{-\frac{2}{5}}}{81^{\frac{3}{4}}}$  (8)
- 3.1.2  $\frac{2^{x-1} \cdot 8^{x-2}}{16^{x-1}}$  (5)
- 3.1.3  $\sqrt{75} - \sqrt{27} + 2\sqrt{12}$  (5)
- 3.2 Solve for x without using a calculator:
- 3.2.1  $4^{2x} = 8^{3x-5}$  (4)
- 3.2.2  $\frac{1}{2}x^{\frac{1}{3}} = 2$  (3)
- [25]**

**VRAAG 4**

4.1 Vereenvoudig die volgende sonder die gebruik van 'n sakrekenaar.

- 4.1.1  $2 \log_4 32$  (3)  
 4.1.2  $5 \log 2 + 2 \log 5 - \log 8$  (5)  
 4.1.3  $\log_9 \sqrt{9} + 2 \log 1 - \log_6 36$  (6)

4.2 Los op vir x

- 4.2.1  $\log x - 1 = 2$  (2)  
 4.2.2  $3^{x+2} = 243$  (2)

4.3 Los op vir x deur gebruik te maak van die intervalhalveringsmetode, benader tot 1 desimale getal.

$3^x = 10$  (5)  
**[23]**

**VRAAG 5**

5.1 Trek die tabel oor in jou antwoordboek en voltooi dit met behulp van jou sakrekenaar.

	-2	-1	0	1	2
$y = 2^x$					
$y = \frac{1}{2}^x$					

(4)

5.2 Skets die grafiek van die tabel in Vraag 5.1  $y = 2^x$  en  $y = \frac{1}{2}^x$  op dieselfde assestelsel.

(6)

5.3 Skets die grafiek van  $y = \log_2 x$  op dieselfde assestelsel as Vraag 5.2 en maak gebruik van simmetrie.

(2)

5.4 Gebruik bogenoemde grafieke en bepaal die waarde van x as

- 5.4.1  $2^x = 1$  (1)  
 5.4.2  $\frac{1}{2}^x = 2$  (1)  
 5.4.3  $\log_2 x = 0$  (1)

**[15]**

**QUESTION 4**

4.1 Solve the following without the use of a calculator

- 4.1.1  $2 \log_4 32$  (3)  
 4.1.2  $5 \log 2 + 2 \log 5 - \log 8$  (5)  
 4.1.3  $\log_9 \sqrt{9} + 2 \log 1 - \log_6 36$  (6)

4.2 Solve for x

- 4.2.1  $\log x - 1 = 2$  (2)  
 4.2.2  $3^{x+2} = 243$  (2)

4.3 Solve for x by using the interval bisection method, rounded off to one decimal digit.

$3^x = 10$  (5)  
**[23]**

**QUESTION 5**

5.1 Copy the table in your answer book and complete it by using your calculator.

	-2	-1	0	1	2
$y = 2^x$					
$y = \frac{1}{2}^x$					

(4)

5.2 Represent the table  $y = 2^x$  and  $y = \frac{1}{2}^x$  in Question 5.1 graphically, on the same set of axes.

(6)

5.3 Using symmetry, sketch the graph of  $y = \log_2 x$  on the same set of axes in Question 5.2.

(2)

5.4 Using the graphs above, determine the value of x if

- 5.4.1  $2^x = 1$  (1)  
 5.4.2  $\frac{1}{2}^x = 2$  (1)  
 5.4.3  $\log_2 x = 0$  (1)

**[15]**

**VRAAG 6**

- 6.1 Bepaal:  $\lim_{x \rightarrow -2} x^2 - 3x + 2$  (2)
- 6.2 Bepaal  $f'(x)$  uit eerste beginsels as  $f(x) = x^2 + 3$  (6)
- 6.3 Bepaal  $g'(x)$  as:
- 6.3.1  $g(x) = \frac{1}{3}x^3 + 4x^2$  (2)
- 6.3.2  $g(x) = 2x^2 - x$  (2)
- 6.4 As  $f(x) = 3x^2 - x + 2$ , bepaal
- 6.4.1  $f(1)$  (1)
- 6.4.2  $f'(x)$  (2)
- 6.4.3  $f'(1)$  (1)
- 6.4.4 die vergelyking van die raaklyn aan die kromme van  $f(x)$  by die punt waar  $x = 1$ . (4)
- [20]**

**VRAAG 7**

- 7.1 'n Klip word vertikaal op in die lug gegooi sodat dit  $t$  sekondes nadat dit gegooi is, sy hoogte deur die vergelyking  $f(t) = 80t - 5t^2$  gegee kan word, waar  $t$  die tyd in sekondes en  $f(t)$  die afstand in meter is.
- 7.1.1 Bereken hoe lank dit die klip sal neem om sy maksimum hoogte te bereik, as  $f'(t) = 0$  (3)
- 7.1.2 Bereken die maksimum hoogte wat die klip sal bereik, as  $t = 8$  (2)
- 7.1.3 As  $f'(t)$  die spoed van die klip is,  $t$  sekondes nadat dit gegooi is, bereken die spoed drie sekondes nadat die klip gegooi is. (2)
- [7]**

**VRAAG 8**

Gebruik die vergelyking en beantwoord die onderstaande vrae.

$$h(x) = x^3 - 6x^2$$

- 8.1 Bereken waar die kromme van  $h(x)$  die  $x$ -as en die  $y$ -as sny. (3)
- 8.2 Bereken die koördinate van die draaipunte van die kromme van  $h(x)$ . (7)
- 8.3 Gebruik hierdie inligting om 'n sketsgrafiek van  $h(x)$  te teken. (3)
- [13]**

**TOTAAL: 150**



### QUESTION 6

- 6.1 Determine:  $\lim_{x \rightarrow -2} x^2 - 3x + 2$  (2)
- 6.2 Determine  $f'(x)$  from first principles if  $f(x) = x^2 + 3$  (6)
- 6.3 Determine:  $g'(x)$  if:
- 6.3.1  $g(x) = \frac{1}{3}x^3 + 4x^2$  (2)
- 6.3.2  $g(x) = 2x^2 - x$  (2)
- 6.4 If  $f(x) = 3x^2 - x + 2$ , determine
- 6.4.1  $f(1)$  (1)
- 6.4.2  $f'(x)$  (2)
- 6.4.3  $f'(1)$  (1)
- 6.4.4 the equation of the tangent to the curve of  $f(x)$  at the point where  $x = 1$ . (4)
- [20]**

### QUESTION 7

- 7.1 A stone is thrown vertically upwards so that  $t$  seconds after it is thrown, its height is given by the equation  $f(t) = 80t - 5t^2$ , where  $t$  is the time in seconds and  $f(t)$  is the distance in metres.
- 7.1.1 Calculate the time taken for the stone to reach its maximum height, if  $f'(t) = 0$ . (3)
- 7.1.2 Calculate the maximum height which the stone will reach, if  $t = 8$ . (2)
- 7.1.3 If  $f'(t)$  is the velocity at time  $t$ , calculate the velocity three seconds after the stone is thrown. (2)
- [7]**

### QUESTION 8

Use the equation and answer the questions below.

$$h(x) = x^3 - 6x^2$$

- 8.1 Calculate where the curve of  $h(x)$  intersects the  $x$  axis and the  $y$  axis. (3)
- 8.2 Calculate the co-ordinates of the turning points of the curve of  $h(x)$ . (7)
- 8.3 Use this information to draw a sketchgraph of  $h(x)$ . (3)
- [13]**

**TOTAL: 150**



**INLIGTINGSBLAD / INFORMATION SHEET**

**Logaritmes / Logarithms:**

$$\log_a PQ = \log_a P + \log_a Q$$

$$\log_a \frac{P}{Q} = \log_a P - \log_a Q$$

$$\log_a P^n = n \log_a P$$

$$\log_a P = \frac{\log_b P}{\log_b Q}$$

**Rye en Reekse / Sequences and Series**

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$S_n = \frac{n}{2}[a + L]$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

**Differensiaalrekenne / Calculus**

$$D_x[x^n] = nx^{n-1}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



**CANDIDATE'S NUMBER:**  
**KANDIDAATNOMMER:**

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**INSTRUCTION / INSTRUKSIE:**

- Complete this graph paper, and place at the back of your answer book.
- *Voltooi hierdie grafiekpapier, en plaas dit agter in jou antwoordboek.*

