

**SENIOR CERTIFICATE
EXAMINATION
SENIORSERTIFIKAAT-EKSAMEN**



**OCTOBER / NOVEMBER
OKTOBER / NOVEMBER**

2004

FUNCTIONAL MATHEMATICS

***FUNKSIONELE
WISKUNDE***

**(First Paper: Algebra)
(Eerste Vraestel: Algebra)**

SG

303-2/1

FUNCTIONAL MATHEMATICS SG: Paper 1
Algebra

**7 pages
7 bladsye**



303 2 1

SG

**COPYRIGHT RESERVED / KOPIEREG VOORBEHOU
APPROVED BY UMALUSI / GOEDGEKEUR DEUR UMALUSI**



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.
- Een vel grafiekpapier word ingesluit aan die einde van die vraestel. Maak gebruik daarvan om Vraag 5 te beantwoord.

VRAAG 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 Die agtiende term is 32 en die tiende term is 8. Bepaal
- 1.1.1 die konstante verskil. (4)
- 1.1.2 die eerste drie terme. (3)
- 1.1.3 die vyftiende term. (3)
- 1.2 In die ry 3, 8, 13 bepaal watter term is gelyk aan 128. (6)
- 1.3 Bepaal die som van $6 + 2^{-2}$ tot by die eerste agtien terme. (6)
- [22]**

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 The eighteenth term is 32 and the tenth term is 8. Determine
- 1.1.1 the common difference. (4)
 - 1.1.2 the first three terms. (3)
 - 1.1.3 the fifteenth term. (3)
- 1.2 In the sequence 3, 8, 13 determine which term is equal to 128. (6)
- 1.3 Calculate the sum of $6 + 2 - 2$ up to the first eighteen terms. (6)
- [22]**

VRAAG 2

Gebruik die toepaslike formules om die vrae hieronder te beantwoord.

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

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

- 2.1 In die meetkundige ry $x + 3$; $x + 1$ en $x - 2$
- 2.1.1 bewys $x = -7$ (5)
- 2.1.2 bepaal die eerste drie terme. (3)
- 2.1.3 bereken die konstante verhouding. (1)
- 2.2 Bepaal die aantal terme van $\frac{1}{81}; \frac{1}{27}; \frac{1}{9} \dots 9$ (6)
- 2.3 Die agtste term is 896 en die konstante verhouding is 2.
 Bepaal die eerste term. (5)
- [20]**

VRAAG 3

- 3.1 Vereenvoudig die volgende sonder die gebruik van 'n sakrekenaar.
- 3.1.1 $\frac{\sqrt{180}}{\sqrt{125} - \sqrt{20}}$ (6)
- 3.1.2 $\frac{3^{x+1} \cdot 2 - 3^{x-1}}{3^x \cdot 2 - 3^x}$ (7)
- 3.1.3 $\frac{8^{x-1} \cdot 4^{1-x}}{2^{x+1}}$ (6)
- 3.1.4 $81^{\frac{2}{8}} + 25^{\frac{5}{10}}$ (4)
- 3.2 Los op vir x :
- 3.2.1 $9^x = \frac{1}{27}$ (4)
- 3.2.2 $3 \cdot 2^x = 48$ (3)
- [30]**

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 In the geometric sequence $x + 3$; $x + 1$ and $x - 2$
- 2.1.1 prove $x = -7$ (5)
- 2.1.2 determine the first three terms. (3)
- 2.1.3 calculate the constant ratio. (1)
- 2.2 Determine the number of terms of $\frac{1}{81}; \frac{1}{27}; \frac{1}{9} \dots 9$ (6)
- 2.3 The eighth term is 896 and the constant ratio is 2. Determine the first term. (5)
- [20]**

QUESTION 3

- 3.1 Simplify the following without the use of a calculator.
- 3.1.1 $\frac{\sqrt{180}}{\sqrt{125} - \sqrt{20}}$ (6)
- 3.1.2 $\frac{3^{x+1} \cdot 2 - 3^{x-1}}{3^x \cdot 2 - 3^x}$ (7)
- 3.1.3 $\frac{8^{x-1} \cdot 4^{1-x}}{2^{x+1}}$ (6)
- 3.1.4 $81^{\frac{2}{8}} + 25^{\frac{5}{10}}$ (4)
- 3.2 Solve for x
- 3.2.1 $9^x = \frac{1}{27}$ (4)
- 3.2.2 $3 \cdot 2^x = 48$ (3)
- [30]**

VRAAG 4

4.1 Vereenvoudig sonder die gebruik van 'n sakrekenaar:

4.1.1 $3\log_6 2 + \log_6 45 - \log_6 10$ (6)

4.1.2 $\log_{16} 2 + \log_3 27 + \log_4 1 - \frac{\log 81}{\log 9}$ (8)

4.2 Los op vir x sonder om 'n sakrekenaar te gebruik:

4.2.1 $\log_2 x = 5$ (2)

4.2.2 $\log_{25} 5 = x$ (4)

4.3 Gebruik 'n sakrekenaar en los op vir x , afgerond tot twee desimale syfers:

$5^x = 28$ (3)

[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
$y = 3^x$					
$y = \log_{1/3} x$					

(4)

5.2 Teken die grafieke van $y = 3^x$ en $y = \log_{1/3} x$ op dieselfde assestelsel. (6)

5.3 Gebruik die grafieke en bepaal

5.3.1 die waarde van x as $3^x = 1$ (2)

5.3.2 die waarde van x as $\log_{1/3} x = -2$ (2)

5.3.3 Dui aan met 'n **A** op die grafieke waar $3^x = \log_{1/3} x$ op die grafiek geleë is. (1)

[15]

VRAAG 6

6.1 Bereken die gemiddelde gradiënt van die kromme $f(x) = -3x^2$ tussen die punte (1;-3) en (2;-12). (3)

6.2 Bepaal: $\lim_{x \rightarrow 3} \frac{x+3}{x^2+3x}$ (3)

6.3 Bepaal $f'(x)$ vanuit eerste beginsels as $f(x) = 4x + 1$ (6)

QUESTION 4

4.1 Simplify without using a calculator:

4.1.1 $3\log_6 2 + \log_6 45 - \log_6 10$ (6)

4.1.2 $\log_{16} 2 + \log_3 27 + \log_4 1 - \frac{\log 81}{\log 9}$ (8)

4.2 Solve for x without using a calculator:

4.2.1 $\log_2 x = 5$ (2)

4.2.2 $\log_{25} 5 = x$ (4)

4.3 With the aid of a calculator, solve for x correct to two decimal digits:

$5^x = 28$ (3)

[23]

QUESTION 5

5.1 Copy and complete the table using your calculator.

	-2	-1	0	1	2
$y = 3^x$					
$y = \log_{\frac{1}{3}} x$					

(4)

5.2 Sketch the graphs of $y = 3^x$ and $y = \log_{\frac{1}{3}} x$ on the same set of axes.

(6)

5.3 Use the graphs and determine the

5.3.1 value of x, $3^x = 1$ (2)

5.3.2 value of x, $\log_{\frac{1}{3}} x = -2$ (2)

5.3.3 Indicate by using an A, where $3^x = \log_{\frac{1}{3}} x$ is on the graph. (1)

[15]

QUESTION 6

6.1 Calculate the average gradient of the curve $f(x) = -3x^2$, between the points (1;-3) and (2;-12).

(3)

6.2 Determine: $\lim_{x \rightarrow 3} \frac{x + 3}{x^2 + 3x}$

(3)

6.3 Determine $f'(x)$ from first principles if $f(x) = 4x + 1$

(6)

6.4 Bepaal: $g'(x)$ as:

6.4.1 $g(x) = -3x - x^2$ (2)

6.4.2 $g(x) = -x(x^2 - 1)$ (4)

6.5 As $f(x) = 2x^2 + x - 1$ bepaal,

6.5.1 $f(1)$

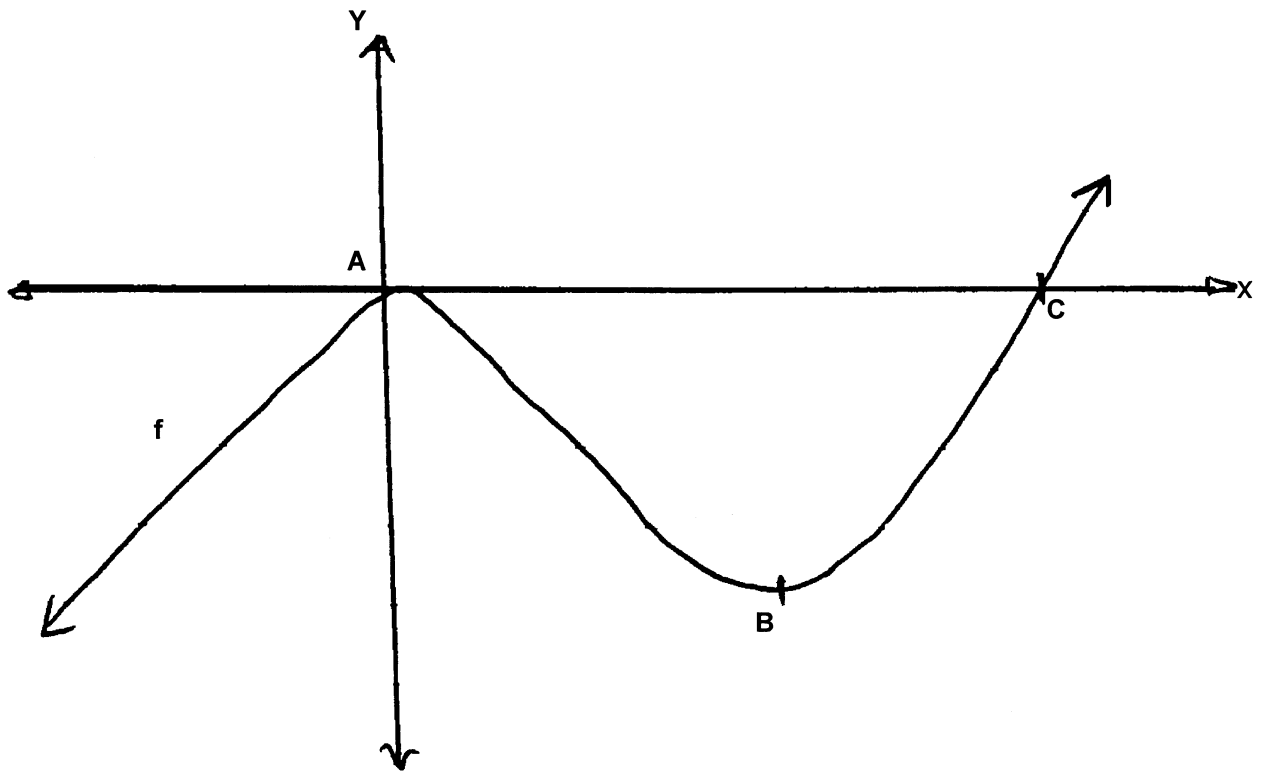
6.5.2 $f'(x)$

6.5.3 $f'(1)$

6.5.4 die vergelyking van die raaklyn aan die kromme ($y - y_1 = m(x - x_1)$) van $f(x)$ by die punt waar $x = 1$.

(7)
[25]

VRAAG 7



Hierbo is die grafiek van $f(x) = x^3 - 3x^2$

7.1 Bepaal die koördinate van C, as C die x – as afsnit is van $f(x)$. (5)

7.2 Bepaal die koördinate van A en B, as dit die draaipunte is van $f(x)$. (10)
[15]

TOTAAL: 150

6.4 Determine: $g'(x)$ if:

6.4.1 $g(x) = -3x - x^2$ (2)

6.4.2 $g(x) = -x(x^2 - 1)$ (4)

6.5 If $f(x) = 2x^2 + x - 1$ determine,

6.5.1 $f(1)$

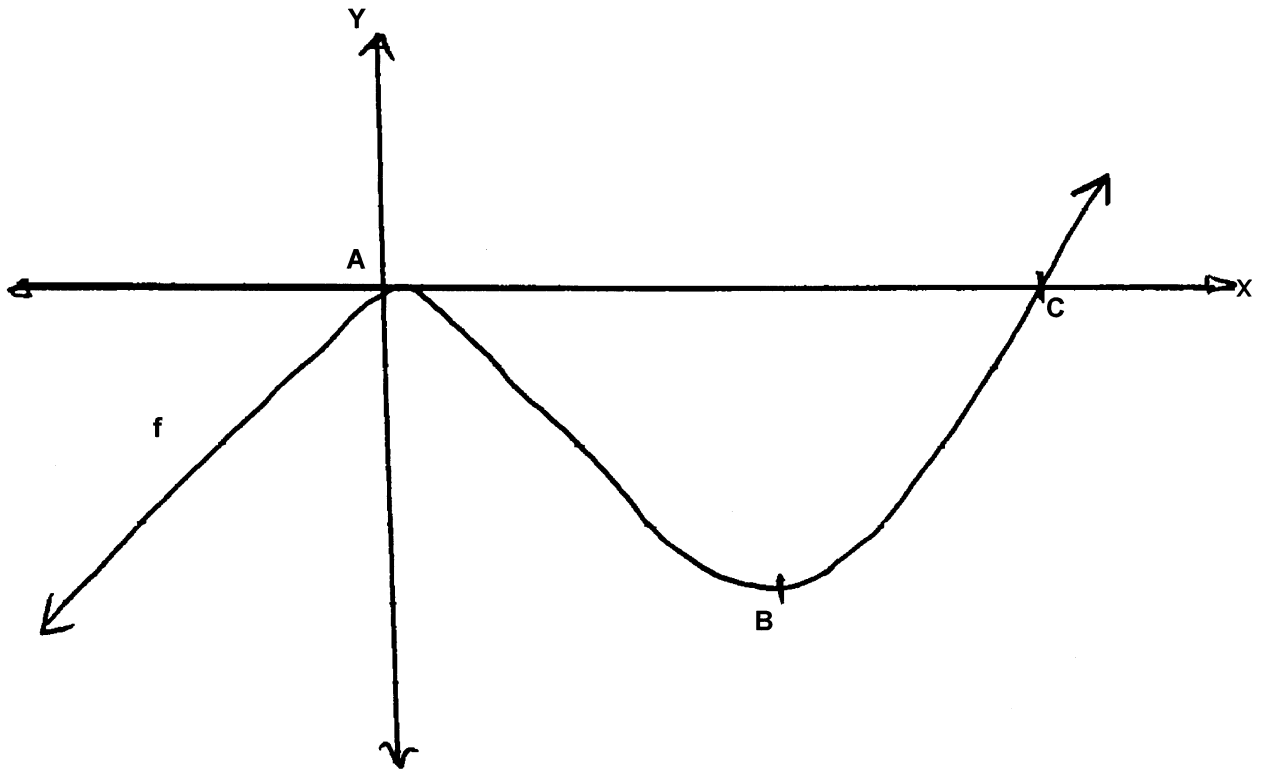
6.5.2 $f'(x)$

6.5.3 $f'(1)$

6.5.4 the equation of the tangent ($y - y_1 = m(x - x_1)$) to the curve of $f(x)$ at the point where $x = 1$.

(7)
[25]

QUESTION 7



This is the graph of $f(x) = x^3 - 3x^2$

7.1 Determine the coordinates of C, being the x axis intercept of $f(x)$. (5)

7.2 Determine the coordinates of A and B, being the turning points of $f(x)$. (10)
[15]

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

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

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

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

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

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

Differensiaalrekenen / 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:
KANDIDAAT NOMMER:

--	--	--	--	--	--	--	--	--	--	--	--	--

