

**GAUTENG DEPARTMENT OF EDUCATION /
GAUTENGSE DEPARTEMENT VAN ONDERWYS**

SENIOR CERTIFICATE EXAMINATION / SENIORSERTIFIKAAT-EKSAMEN

**FUNCTIONAL MATHEMATICS SG /
FUNKSIONELE WISKUNDE SG**
(First Paper / Eerste Vraestel: Algebra)

Possible Answers / Moontlike Antwoorde
Feb / Mar / Maart 2006

QUESTION / VRAAG 1

1.1 1.1.1 $(27)^{\frac{2}{3}} + 16$
 $= (3^3)^{\frac{2}{3}} + 16$ v
 $= 3^2 + 16$
 $= 9 + 16$
 $= 25$ v (3)

1.1.2 $4\sqrt{8} + 3\sqrt{18} - \sqrt{50}$
 $= 4 \cdot 2\sqrt{2} + 3 \cdot 3\sqrt{2} - 5\sqrt{2}$ vv
 $= 8\sqrt{2} + 9\sqrt{2} - 5\sqrt{2}$ vv
 $= 12\sqrt{2}$ v (6)

1.1.3 $\frac{32^x \cdot 16^{1-x}}{2^{x-1}}$
 $= \frac{2^{5x} \cdot (2^4)^{1-x}}{2^{x-1}}$ vv
 $= \frac{2^{5x} \cdot 2^{4-4x}}{2^{x-1}}$ v
 $= 2^{5x+4-4x-x+1}$ v
 $= 2^5$
 $= 32$ v (5)

1.1.4 $\frac{5^{x+2} - 5^x}{5^{x-1}}$
 $= \frac{5^x \cdot 5^2 - 5^x}{5^{x-1}}$
 $= \frac{5^x \cdot 5^1}{5^{x-1}}$ vv
 $= 5^x (5^2 - 1)$ vv
 $= 5^x \cdot 5^{-1}$
 $= 24 \div \frac{1}{5}$ v
 $= 24 \times 5 = 120$ v (4)

$$\begin{aligned}
 1.2 \quad 1.2.1 \quad 2^x &= 0,25 \\
 \therefore 2^x &= \frac{1}{4} \text{ v} \\
 \therefore 2^x &= 2^{-2} \text{ v} \\
 \therefore x &= -2 \text{ v}
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 1.2.2 \quad 16^{2x-1} &= 8^{3x-6} \\
 \therefore 2^{4(2x-1)} &= 2^{3(3x-6)} \text{ v v} \\
 \therefore 4(2x-1) &= 8(3x-6) \text{ v} \\
 \therefore 8x-4 &= 9x-18 \text{ v v} \\
 \therefore -x &= -14 \\
 \therefore x &= 14 \text{ v}
 \end{aligned} \tag{6}$$

[27]

QUESTION / VRAAG 2

$$\begin{aligned}
 2.1 \quad 2.1.1 \quad \log 5x &= 3 \\
 \therefore 10^3 &= 5x \text{ v} \\
 \therefore 5x &= 1\,000 \text{ v} \\
 \therefore x &= 200 \text{ v}
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 2.1.2 \quad \log_2(x-1) &= 3 \\
 \therefore 2^3 &= x-1 \text{ v} \\
 \therefore x-1 &= 8 \text{ v} \\
 \therefore x &= 9 \text{ v}
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 2.2 \quad 3^x &= 18 \\
 \therefore \log 3^x &= \log 18 \text{ v} \\
 \therefore x \log 3 &= \log 18 \\
 \therefore x &= \frac{\log 18}{\log 3} \text{ v} \\
 \therefore x &= 2,63 \text{ v}
 \end{aligned}$$

OR/OF

$$\begin{aligned}
 x &= \log_3 18 \text{ v} \\
 \therefore x &= \frac{\log 18}{\log 3} \text{ v} \\
 \therefore x &= 2,63 \text{ v}
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 2.3 \quad 2.3.1 \quad \log_3 \frac{1}{3} \\
 &= \log_3 3^{-1} \text{ v} \\
 &= -\log_3 3 \\
 &= -1 \text{ v}
 \end{aligned} \tag{2}$$

$$2.3.2 \quad \log 8 + \log 20 - \log 16$$

$$= \log \left(\frac{8 \times 20}{16} \right) \text{vv}$$

$$= \log 10 \text{v}$$

$$= 1 \text{v}$$

(4)

$$2.3.3 \quad 3\log_4 2 - 2\log_2 4 + \log 10$$

$$= \frac{3\log 2}{\log 4} - 2\log_2 2^2 + 1 \text{vv}$$

$$= \frac{3\log 2}{2\log 2} - 4\log_2 2 + 1 \text{vv}$$

$$= \frac{3}{2} - 4 + 1 \text{v}$$

$$= -1 \frac{1}{2} \text{v}$$

(6)

$$2.4 \quad \log 18$$

$$= \log(3 \times 3 \times 2) \text{v}$$

$$= \log 3 + \log 3 + \log 2 \text{v}$$

$$= b + b + a$$

$$= 2b + a \text{v}$$

(3)

[24]**QUESTION / VRAAG 3**

3.1

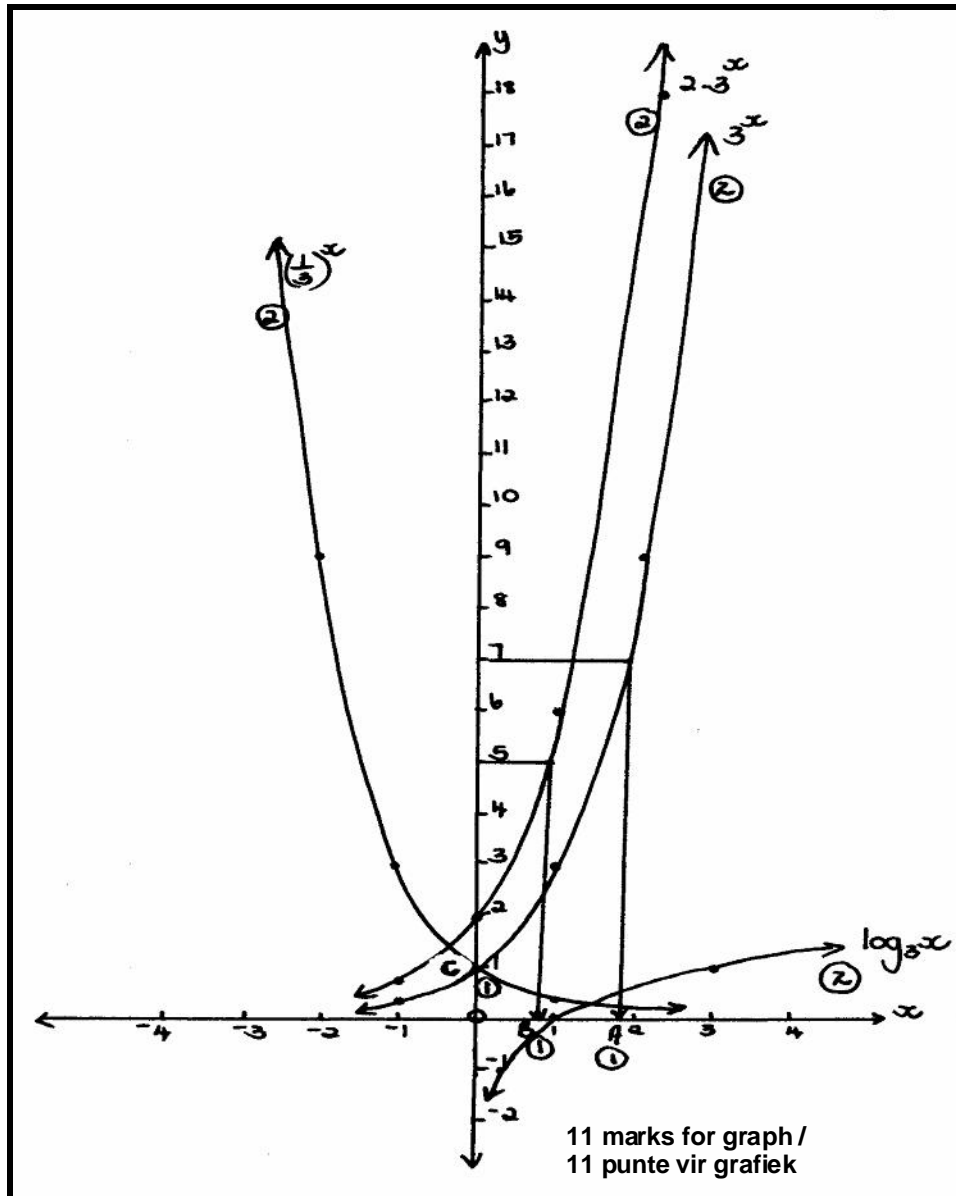
x	-1	0	1	2	3	
3^x	1/3	1	3	9	27	vv
$(\frac{1}{3})^x$	3	1	1/3	1/9	1/27	vv
$2 \cdot 3^x$	2/3	2	6	18	54	vv

(6)

+ 6 Marks graph

Part of Question 3.1, 3.2 and part of 3.3

3.2



(11)

3.3 3.3.1 1,8v

(6) marks 3.1 first 3 graphs

3.3.2 0,8v

(2) marks 3.2 $-\log_3 x$

3.3.3 $x = 0v$

(3) marks 3.3 A, B and C

(3)

+3 marks graph

[20]

QUESTION / VRAAG 4

$$\begin{aligned}
 4.1 \quad 4.1.1 \quad T_{12} &= 3 + (12-1)3 \text{ v} \\
 &= 3 + 33 \\
 &= 36 \text{ v}
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 4.1.2 \quad S_{21} &= \frac{21}{2} [2(3) + (21-1)3] \text{ v} \\
 &= 10,5[6 + 60] \\
 &= 10,5[66] \\
 &= 693 \text{ v}
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 4.2 \quad T_n &= a + (n-1)d \\
 \therefore 0 &= 600 + (n-1)(-50) \text{ v} \\
 \therefore 0 &= 600 - 50n + 50 \\
 \therefore 50n &= 650 \\
 \therefore n &= 13 \text{ v}
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 4.3 \quad 4.3.1 \quad 4x - 8 - (2x - 6) &= 2x - 6 - (16 - 4x) \text{ v} \\
 \therefore 4x - 8 - 2x + 6 &= 2x - 6 - 16 + 4x \\
 \therefore 2x - 2 &= 6x - 22 \text{ v} \\
 \therefore -4x &= -20 \\
 \therefore x &= 5 \text{ v}
 \end{aligned} \tag{5}$$

$$\begin{aligned}
 4.3.2 \quad T_1 &= 16 - 4(5) \\
 &= -4 \text{ v} \\
 T_2 &= 2(5) - 6 \\
 &= 4 \text{ v} \\
 T_3 &= 4(5) - 8 \\
 &= 12 \text{ v}
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 4.4 \quad T_{17} &= a + 16d = 39 \text{ v} \\
 T_3 &= a + 2d = 11 \text{ v} \\
 14d &= 28 \\
 \therefore d &= 2 \text{ v}
 \end{aligned}$$

$$\begin{aligned}
 \therefore a + 2(2) &= 11 \\
 \therefore a &= 7 \text{ v} \\
 \therefore 7; 9; 11 \text{ v}
 \end{aligned}$$

(6)
[24]

QUESTION / VRAAG 5

$$\begin{aligned}
 5.1 \quad 5.1.1 \quad T_{10} &= ar^9 \\
 &= \frac{1}{9} (3)^9 v \\
 &= \frac{1}{9} (19683) v \\
 &= 2187 v
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 5.1.2 \quad S_8 &= \frac{1}{9} \frac{(3^8 - 1)}{3 - 1} v \\
 &= \frac{1}{9} (6560) \\
 &= 364,44 / 364 \frac{4}{9} v
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 5.2 \quad T_n &= ar^{n-1} \\
 \therefore \frac{1}{16} &= 16 \left(\frac{1}{2}\right)^{n-1} v \\
 \therefore \frac{1}{256} &= \left(\frac{1}{2}\right)^{n-1} v \\
 \therefore \left(\frac{1}{2}\right)^8 &= \left(\frac{1}{2}\right)^{n-1} v \\
 \therefore 8 &= n - 1 \\
 \therefore n &= 9 v
 \end{aligned} \tag{6}$$

$$\begin{aligned}
 5.3 \quad T_7 &= ar^6 = 192 v \\
 T_4 &= ar^3 = -24 v \\
 \therefore r^3 &= -8 v \\
 \therefore r &= -2 v \\
 \therefore a(-2)^3 &= -24 \\
 \therefore 8a &= -24 \\
 \therefore a &= 3 v \\
 \therefore 3; -6; 12 v
 \end{aligned} \tag{7}$$

[20]

QUESTION / VRAAG 6

$$\begin{aligned}
 6.1 \quad & \lim_{x \rightarrow 2} \frac{x^2 - 2x - 8}{x + 2} \\
 &= \lim_{x \rightarrow 2} \frac{(x-4)(x+2)}{x+2} \quad \checkmark \\
 &= \lim_{x \rightarrow 2} \frac{x+2}{x-4} \\
 &= 2 - 4\checkmark \\
 &= -2\checkmark
 \end{aligned} \tag{3}$$

$$6.2 \quad f(x) = 3x + 8$$

$$6.2 \quad 6.2.1 \quad \begin{aligned} f(x+h) &= 3(x+h) + 8\checkmark \\ &= 3x + 3h + 8\checkmark \end{aligned} \tag{2}$$

$$\begin{aligned}
 6.2.2 \quad & \lim_{x \rightarrow 0} \frac{f(x+h) - f(x)}{h} \quad \checkmark \\
 &= \lim_{x \rightarrow 0} \frac{3x + 3h + 8 - (3x + 8)}{h} \quad \checkmark \\
 &= \lim_{x \rightarrow 0} \frac{3x + 3h + 8 - 3x - 8}{h} \\
 &= \lim_{x \rightarrow 0} \frac{3h}{h} \quad \checkmark \\
 &= 3\checkmark
 \end{aligned} \tag{4}$$

$$6.3 \quad 6.3.1 \quad \begin{aligned} D_x[6x^4 - 2x + 5] \\ = 24x^3 - 2 + 0\checkmark\checkmark\checkmark \end{aligned} \tag{3}$$

$$6.3.2 \quad \begin{aligned} D_x[2x^3(5x-1)] \\ = D_x[10x^4 - 2x^3]\checkmark\checkmark \\ = 40x^3 - 6x^2\checkmark\checkmark \end{aligned} \tag{4}$$

$$6.4 \quad 6.4.1 \quad \begin{aligned} y &= 800t - 16t^2 \\ \therefore y &= 800(5) - 16(5)^2\checkmark \\ &= 4000 - 400 \\ &= 3600\checkmark\checkmark \end{aligned} \tag{2}$$

$$6.4.2 \quad \frac{dy}{dt} = 800 - 32t\checkmark\checkmark \tag{2}$$

$$6.4.3 \quad \begin{aligned} 800 - 32t &= 0\checkmark \\ -32t &= -800\checkmark \\ \therefore t &= 25\checkmark \end{aligned} \tag{3}$$

$$\begin{aligned}
 6.4.4 \quad y &= 800(25) - 16(25)^2 \text{ v} \\
 &= 20\,000 - 10\,000 \\
 &= 10\,000 \text{ m v}
 \end{aligned}$$

(2)
[25]**QUESTION / VRAAG 7**

7.1 $A(-1;0) \quad B(2;0) \text{ vv}$

(2)

7.2 $C(0;-2) \text{ v}$

(1)

7.3 $f'x = 3x^2 - 3 \text{ vv}$

(2)

7.4 $f'(x) = 3x^2 - 3 = 0$

$\therefore 3(x^2 - 1) = 0 \text{ v}$

$\therefore 3(x-1)(x+1) = 0 \text{ v}$

$\therefore x = 1 \quad \text{or/of} \quad \begin{matrix} x = -1 \\ n.v.t \end{matrix} \text{ vv}$

$f(1) = 1^3 - 3(1) - 2$

$= 1 - 5$

$= -4$

$\therefore D(1;-4) \text{ v}$

(5)
[10]**TOTAL / TOTAAL: 150**