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 OCT / NOV 2006

QUESTION / *VRAAG* 1

1.1   1.1.1 $\dfrac{2^{x+1} \cdot 8^{x-2}}{16^{x-2}}$

$$= \frac{2^{x+1} \cdot 2^{3(x-2)}}{2^{4(x-2)}} \ ?$$

$$= \frac{2^{x+1} \cdot 2^{3x-6}}{2^{4x-8}} \ ?$$

$$= 2^{4x-5-4x+8} \ ?$$

$$= 2^3$$

$$= 8 \ ? \tag{6}$$

1.1.2 $8^{?} + 5^0 - 64^{?}$

$$= (2^3)^{?} + 1 - (4^3)^{?}$$

$$= 2 + 1 - 16 \ ?$$

$$= -13 \ ? \tag{5}$$

1.1.3 $\dfrac{3^{x+4} - 6 \cdot 3^{x+1}}{3^x \cdot 7}$

$= \dfrac{3^x \cdot 3^4 - 6 \cdot 3^x \cdot 3^1}{3^x \cdot 7}$?

? ?

$= \dfrac{3^x (3^4 - 6.3)}{3^x \cdot 7}$

$= \dfrac{81 - 18}{7}$?

$= 9$? (5)

1.1.4 $\dfrac{2\sqrt{12} + \sqrt{75}}{3\sqrt{3}}$

$= \dfrac{2\sqrt{4.3} + \sqrt{25.3}}{3\sqrt{3}}$ •

•   •

1.1.4 $= \dfrac{4\sqrt{3} + 5\sqrt{3}}{3\sqrt{3}}$

$= \dfrac{9\sqrt{3}}{3\sqrt{3}}$ • (5)

$= 3$ •

1.2 1.2.1 $x^{\frac{3}{4}} = 8$

? ?

$\left(x^{\frac{3}{4}}\right)^{\frac{4}{3}} = \left(2^3\right)^{\frac{4}{3}}$

$x = 2^4$

$x = 16$? (3)

2

1.2.2 $3^{2x+1} = 27$

$3^{2x+1} = 3^3$?

?

$2x + 1 = 3$

$2x = 2$

$x = 1$?   (3)

[27]

QUESTION/ *VRAAG* 2

2.1 2.1.1 $\log 75 + 3 \log 2 - \log 6$

?

$= \log 75 + \log 8 - \log 6$

$= \log \dfrac{75(8)}{6}$?
?

$= \log 100$?

$= 2$?

(5)

2.1.2 $\log_3 81 - \log_6 1 + \log_{25} 5$

?   ?

$= 4 \log_3 3 - 0 + \dfrac{\log 5}{\log 25}$?

$= 4 + \dfrac{\log 5}{2 \log 5}$?

?

$= 4 + \frac{1}{2}$

$= 4\frac{1}{2}$?   (6)

2.2   2.2.1 $\log_6 2x = 1$

$6 = 2x$?

$x = 3$?   (2)

    2.2.2 $\log x = \dfrac{\log 64}{\log 8}$

$= \dfrac{2 \log 8}{\log 8}$?

$\log x = 2$?

$10^2 = x$?

$x = 100$?   (4)

2.3 $25^x = 50$

?

$\log_{25} 50 = x$

$\dfrac{\log 50}{\log 25} = x$?

$x = 1{,}22$?   (3)

  2.4 $\log 75$

$= \log (5 \times 5 \times 3)$?

$= \log 5 + \log 5 + \log 3$?

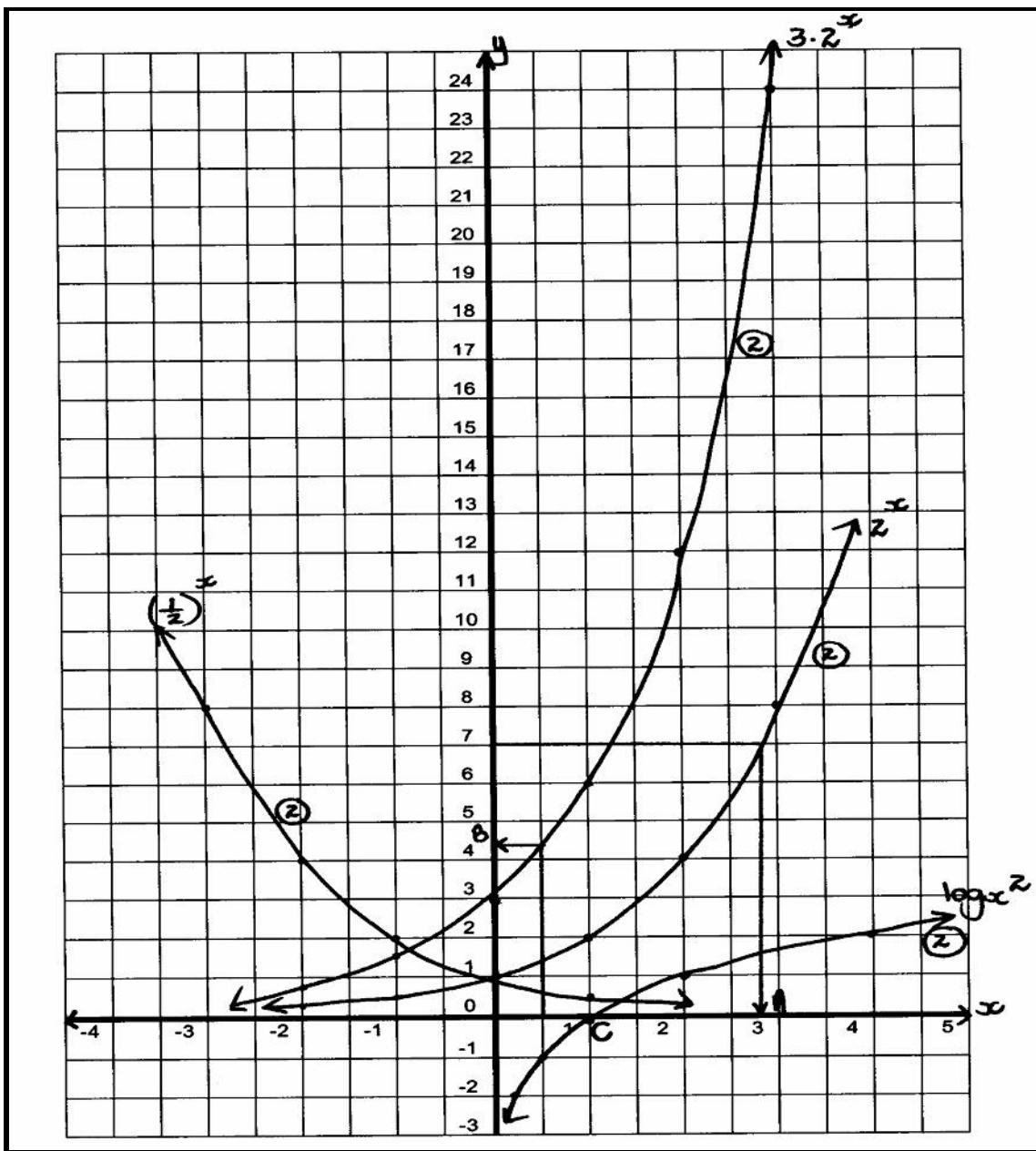$= a + 2b$?   (3)

[23]

4

QUESTION/*VRAAG* 3

3.1

x	-1	0	1	2	3
2^x	½	1	2	4	8?
3.2^x	$\frac{3}{2}$ / 1,5	3	6	12	24?

(2)

3.2 & 3.3

(4) + (4)

3.4   3.4.1 $x = 2,7$ (2)

3.4.2 $y = 4,2$ (2)

3.4.3 $x = 1$ (2)

3.5   y-intercept/*y-afsnit:* $(0 ; 3)$ • (1)

[17]

QUESTION/*VRAAG* **4**

4.1   4.1.1 $T_{50} = a + 49d$?

$= 2 + 49(3)$?

$= 2 + 147$

$= 149$? (3)

4.1.2 $S_n = \frac{n}{2}[2a + (n - 1)d]$?

?   ?   ?

$S_{50} = \frac{50}{2}[2(2) + (50 - 1)(3)]$

$= 25[4 + 49(3)]$

$= 25[4 + 147]$

$= 25[151]$

$= 3775$? (5)

4.2   4.2.1 $T_1 = -3 = a$ ✓

$T_3 = 3$ ✓

$a + 2d = 3$ ✓

$-3 + 2d = 3$

$2d = 6$

$d = 3$ ✓   (4)

4.2.2 $T_{25} = a + 24d$ ✓

$= -3 + 24(3)$ ✓

$= -3 + 72$

$= 69$ ✓   (3)

4.2.3 $Tn = a + (n - 1)d$ ✓

$57 = -3 + (n - 1)(3)$ ✓

$57 = -3 + 3n - 3$ ✓

$-3n = -6 - 57$

$-3n = -63$

$n = 21$ ✓   (4)

4.3 $T_1 = -3(1) + 2 = -1$ ✓

$T_2 = -3(2) + 2 = -4$ ✓

$T_3 = -3(3) + 2 = -7$ ✓   (3)

[22]

7

QUESTION/*VRAAG* 5

5.1   5.1.1 $T_8 = ar^7 = 640$ …… 1   ?

$T_3 = ar^2 = 20$ …... 2   ?

$\underline{1 \div 2}$: $\dfrac{ar^7}{ar^2} = \dfrac{640}{20}$?

$r^5 = 32$?

$r = \sqrt[5]{32}$

$r = 2$?   (5)

5.1.2 $a(2)^2 = 20$?

$4a = 20$

$\underline{a = 5}$?   (2)

5.2   5.2.1 $T_8 = ar^7$?

$= 1(3)^7$?

$= 2187$?   (3)

5.2.2 $S_n = \dfrac{a(r^n - 1)}{r - 1}$?

$S_8 = \dfrac{1(3^8 - 1)}{3 - 1}$?

?

$= \dfrac{6\,561 - 1}{2}$

$= \dfrac{6\,560}{2}$

$= 3\,280$?   (4)

5.3   5.3.1 $\dfrac{T_2}{T_1} = \dfrac{T_3}{T_2}$?

$\dfrac{x + 1}{x} = \dfrac{x + 3}{x + 1}$?

?

$(x + 1)(x + 1) = x(x + 3)$

?

$x^2 + 2x + 1 = x^2 + 3x$

$-x = -1$

$\underline{x = 1}$?   (5)

5.3.2 $T_1 = 1$

$T_2 = 1 + 1 = 2$?

$T_3 = 1 + 3 = 4$?   (2)
[21]

QUESTION/VRAAG 6

6.1   6.1.1 $f(1) = 3(1)^2 = 3$?

$f(4) = 3(4)^2 = 48$?

<u>average gradient/ gemid. gradiënt</u>:

$$= \frac{48 - 3}{4 - 1} \text{ ?}$$

$$= \frac{45}{3}$$

$$= 15 \text{ ?}$$ (4)

6.1.2   (a) $f(x) = 3x^2$

?

$f(x + h) = 3(x + h)^2$

$$= 3(x^2 + 2xh + h^2)$$
?
$$= 3x^2 + 6xh + 3h^2$$ (2)

(b) $f'(x) = \lim_{h \to 0} \dfrac{f(x + h) - f(x)}{h}$?

$$= \lim_{h \to 0} \frac{3x^2 + 6xh + 3h^2 - 3x^2}{h}$$

$$= \lim_{h \to 0} \frac{6xh + 3h^2}{h} \text{ ?}$$

$$= \lim_{h \to 0} \frac{h(6x + h)}{h} \text{ ?}$$

$$= 6x + 0$$

$$= 6x \text{ ?}$$ (4)

6.2   6.2.1 $f(x) = 3$

$f'(x) = 0$ ✓   (1)

6.2.2 $f(x) = 3x^6 - 2x$
        ✓   ✓
$f'(x) = 18x^5 - 2$ (2)

6.2.3 $f(x) = (x + 1)(3x - 2)$
        ✓ ✓
$= 3x^2 + x - 2$
        ✓   ✓
$f'(x) = 6x + 1$ (4)

6.3   6.3.1 $f(x) = 2x^2 - 4x$

$f(2) = 2(2)^2 - 4(2)$ ✓

$= 8 - 8$

$= 0$ ✓   (2)

6.3.2 $f(x) = 2x^2 - 4x$
        ✓   ✓
$f'(x) = 4x - 4$ (2)

6.3.3 $f'(2) = 4(2) - 4$ ✓

$= 8 - 4$

$= 4$ ✓   (2)

6.3.4   <u>$m = 4$ $(2 ; 0)$</u>:

$y - y_1 = m(x - x_1)$
        ✓ ✓   ✓
$y - 0 = 4(x - 2)$

$y = 4x - 8$ ✓   (4)

6.4 $\lim\limits_{x \to 3} \dfrac{x^2 - 9}{x - 3}$

$\quad = \lim\limits_{x \to 3} \dfrac{(x - 3)(x + 3)}{x - 3}$ ✓

$\quad = \lim\limits_{x \to 3} x + 3$

$\quad = 3 + 3$ ✓

$\quad = 6$ ✓

(3)

[30]

QUESTION/*VRAAG* 7

7.1   7.1.1   A(0; 0)   (1)

7.1.2 $f(x) = x^3 - 6x^2 + 9x$
                          ✓

        $f'(x) = 3x^2 - 12x + 9 = 0$ ✓

                      ✓

        $x^2 - 4x + 3 = 0$

        $(x - 3)(x - 1) = 0$
          ✓   ✓

        $x = 3$ or/of $x = 1$

    $f(x) = (3)^3 - 6(3)^2 + 9(3)$

      $= 27 - 54 + 27$

      $= 0$ ✓   C(3 ; 0) ✓

    $f(1) = (1)^3 - 6(1)^2 + 9(1)$

      $= 1 - 6 + 9$

      $= 4$ ✓   B(1 ; 4) ✓

(9)

[10]

TOTAL/*TOTAAL*: 150

12