GAUTENG DEPARTMENT OF EDUCATION

SENIOR CERTIFICATE EXAMINATION

OCTOBER / NOVEMBER 2005
OKTOBER / NOVEMBER 2005

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 7.
- A sheet of graph paper is provided at the back of the question paper. Use it to answer Question 3.

QUESTION 1

1.1 Simplify, without using a calculator.

1.1.1 $2^0 - 125^{\frac{2}{3}} + 27^{-\frac{1}{3}}$ (5)

1.1.2 $\dfrac{\sqrt{45}+\sqrt{5}}{\sqrt{80}}$ (4)

1.1.3 $\sqrt{48} \cdot \sqrt{27}$ (3)

1.1.4 $\dfrac{4^x \cdot 2^{x+1}}{8^{x-1}}$ (4)

1.1.5 $\dfrac{5^{x+1} + 5^x}{3.5^x}$ (3)

1.2 Solve for x, without using a calculator.

1.2.1 $16^{x-1} = 8^{x}$ (4)

1.2.2 $x^{-\frac{3}{2}} = 27$ (3)

1.2.3 $25^{x} = \frac{1}{625}$ (3)

[29]

QUESTION 2

2.1 Simplify, without using a calculator.

2.1.1 $5 \log_4 64$ (3)

2.1.2 $\log_7 14 - \log_7 2$ (2)

2.1.3 $\log_3 \frac{1}{9} + \log_2 8$ (4)

2.1.4 $\frac{\log 27}{\log 81} + \log_3 1$ (4)

2.2 Solve for x, without using a calculator.

2.2.1 $\log_x 32 = 5$ (3)

2.2.2 $\log_2(x-3) = -1$ (3)

2.3 Solve for x, rounded off to two decimal digits.

$7^{x} = 27$ (3)

2.4 If $\log 8 = x$, determine $\log 800$ in terms of x. (3)

[25]

QUESTION 3

3.1 Complete the following tables for the given functions.

3.1.1 $y = 2^{x}$

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

(2)

3.1.2 $y = 3.2^x$

x	-1	0	1	2	3
$y = 3.2^x$					

(2)

3.2 Draw the graphs of $y = 2^x$ and $y = 3.2^x$ on the same set of axes. Use the graph paper provided at the end of the question paper. (4)

3.3 Make use of **symmetry** and draw the graphs of $y = (½)^x$ and $y = \log_2 x$ on the same set of axes used in Question 3.2. (4)

3.4 Use the graphs and read off the value of the following. Indicate clearly on the graph where the readings were made (use A, B and C):

3.4.1 $2^x = 7$ $x = ?$ (2)

3.4.2 $3.2^x = 10$ $x = ?$ (2)

3.4.3 $y = (½)^{-1}$ $y = ?$ (2)

[18]

QUESTION 4

USE ONLY THE FOLLOWING FORMULAE TO ANSWER THE FOLLOWING QUESTION.

$$\mathbf{Tn = a + (n-1)d} \qquad \mathbf{Sn = \frac{n}{2}[2a+(n-1)d]}$$

4.1 In the sequence 11; 18; 25; …..

4.1.1 Determine the twelfth term. (3)

4.1.2 Determine the sum of the first 21 terms of the sequence. (3)

4.2 In the sequence 500; 450; 400; ….. Which term will be equal to 0? (4)

4.3 $2x-3;\ 5x+2;\ x-7$ are the first 3 terms of an arithmetic sequence.

4.3.1 Show by calculation that the value of $x = -2$. (5)

4.3.2 Determine the sequence. (3)

4.4 If the fifth term of an arithmetic sequence is 7 and the tenth term is 27, determine the sequence. (6)

[24]

QUESTION 5

USE ONLY THE FOLLOWING FORMULAE TO ANSWER THE FOLLOWING QUESTION.

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

5.1 In the sequence 4; 8; 16; ….

5.1.1 Determine the tenth term. (3)

5.1.2 Determine the sum of the first 15 terms of the sequence. (3)

5.2 In the sequence $\frac{5}{9}$; $\frac{5}{3}$; 5 ….. Which term will be equal to 10 935? (4)

5.3 Determine the first 3 terms of a geometric sequence of which the eighth term is 448 and the fourth term is 28. (6)

[16]

QUESTION 6

6.1 The distance an object moves in t seconds is given by $s(t) = t^2 + 3t$. Calculate the **average speed** of the object between t = 2 and t = 4 seconds. (4)

6.2 If $f(x) = 2x^2$,

6.2.1 determine $f(x+h)$. (2)

6.2.2 Hence, determine the derivative $f'(x)$ by using the first principle. (4)

6.3 Use the differential laws to determine the derivative $f'(x)$ of:

6.3.1 $f(x) = \frac{2}{3}x^3$ (1)

6.3.2 $f(x) = 2x(x^3+6)$ (4)

6.4 If $f(x) = x^3 - 2x^2 - 5x$ determine:

6.4.1 f (-1) (2)

6.4.2 $f'(x)$ (3)

6.4.3 f'(-1) (2)

6.4.4 The equation of the tangent to the curve of $f(x) = x^3 - 2x^2 - 5x$ at the point where x = -1 (3)

[25]

QUESTION 7

Given: $f(x) = x^3 - 6x^2$

$= x^2(x-6)$

7.1 Calculate where the curve of $f(x)$ intersects the x axis and the y axis. (3)

7.2 Calculate the co-ordinates of the turning points of the curve $f(x)$ if $f'(x) = 0$. (7)

7.3 Use this information to draw a neat sketch graph of the curve of $f(x)$. (3)

[13]

TOTAL: 150