DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
MATHEMATICS N4
TIME: 3 HOURS
MARKS: 100

AUGUST 2012

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Answer ALL FIVE questions in full. Show ALL the calculations and intermediary steps. Simplify where possible
3. Read ALL the questions carefully.
4. Number the answers correctly according to the numbering system used in this question paper.
5. ALL the graph work must be done in the ANSWER BOOK. Graph paper is NOT supplied. Values of intercepts with the system of axes and the turning point(s) must be shown on the graph.
6. ALL final answers must be accurately approximated to THREE decimal places.
7. Questions can be answered in any order but subsections of questions must NOT be separated.
8. A FORMULA SHEET is attached to this question paper. You are NOT compelled to use the formulae and the list is NOT necessarily complete.
9. Write neatly and legibly.

QUESTION 1

1.1 The breadth of a rectangle is 3 m less than its length. Calculate the length and the breadth of the rectangle if the area of the rectangle is 75 m^2. (4)

1.2 Make 'n' the subject of the formula if:

$$s = \frac{a(r^n - 1)}{r - 1}$$ (4)

1.3 Solve for x if:

$$3^{5x-1} = 5^{2x+2}$$ (4)

1.4 Given:

$$3y + 2x = Z + 1$$
$$3x + 2Z = 8 - 5y$$
$$3Z - 1 = x - 2Z$$

Determine the value of y by using Cramer's rule only. (8)
[20]

QUESTION 2

2.1 2.1.1 Sketch the graph of $xy = -10$. (3)

2.1.2 Is the graph of $xy = -10$ discontinuous? (1)

2.2 2.2.1 Sketch the graph of $\frac{x^2}{16} + \frac{y^2}{9} = 1$. (3)

2.2.2 Is the graph of $\frac{x^2}{16} + \frac{y^2}{9} = 1$ asymmetric about the x-axis or not? (2)

2.3 Solve for x if:

$$(x + 1)(x + 4) = -8$$ (4)

2.4 Given:

$$Z = \left(2.4 \angle 86.3°\right)^{½}$$

Use De Moivre's theorem to calculate for Z. Leave the answer in $a + jb$ form. (3)

2.5 Given:

$$Z = -3 - j3$$

2.5.1 Find $\overline{Z}$ (1)

2.5.2 Convert $\overline{Z}$ into polar form. θ must be positive. Show ALL steps. (3)
[20]

QUESTION 3

3.1 Simplify the following:

$$\frac{\cot A + 1}{\tan A + 1}$$ (4)

3.2 Solve for x if:

$$3\sec^2 x - 5 = 4\tan x \;;\quad 0° \le x \le 270°$$ (5)

3.3 Prove that:

$$\frac{\sin 2A - 1}{\sin A - \cos A} = \cos A - \sin A$$ (4)

3.4 Calculate the value of $\sin -75^0$ without a calculator. (4)

3.5 Derive a formula for $\cos 2A$ in terms of $\sin A$. (3)
[20]

QUESTION 4

4.1 Differentiate from first principles if:

$$f(x)=\sqrt[3]{x^6}$$ (4)

4.2 Given:

$$y=(2x^3-7)^4$$

Differentiate by using the chain rule. (4)

4.3 Differentiate with respect to x:

$$y=5x^3-\frac{7}{\sqrt{3x}}-2p+\frac{2}{x^{-3}}-\ell n4x-\cot 2x$$ (6)

4.4 Given:

$$y=x^3+3x^2-9x+5$$

Calculate, with the aid of differentiation, the co-ordinates of the turning points. (6)
[20]

QUESTION 5

5.1 5.1.1 Sketch and clearly indicate the area bounded by the graph of $y=3x^2-12$, the x-axis; $x=0$ and $x=2$. Also, indicate the representative to be used to calculate the area shown. (3)

5.1.2 Calculate, using integration, the magnitude of the area indicated in QUESTION 5.1.1. (4)

5.2 Integrate:

$$\int\left(\frac{3}{x^2}-\frac{4}{x}+7e^{-7x}+16\cos 4x+\text{cosec } x\cot x+4\pi\right)dx$$ (7)

5.3 Determine:

$$\int_{\pi/4}^{\pi/2}2\cos x\,dx$$ (3)

5.4 Simplify:

$$\int(\cos^2 A-\sin^2 A)dA$$ (3)
[20]

TOTAL: 100