T1430(E)(N18)T

MATHEMATICS N4

FORMULA SHEET

NEW SYLLABUS

$a^x = b \Leftrightarrow \log a^x = \log b$

$\ell n\, x = \log_e x$

$(r\,|\underline{\theta})^n = r^n\,|\underline{n\theta}$ $\quad a + bj = c + dj \Leftrightarrow a = c$ and $b = d$

$\sin(a \pm b) = \sin a \cos b \pm \sin b \cos a$
$\cos(a \pm b) = \cos a \cos b \mp \sin a \sin b$

$\sin^2 x + \cos^2 x = 1$
$1 + \cot^2 x = \operatorname{cosec}^2 x$
$1 + \tan^2 x = \sec^2 x$

$$\tan(a \pm b) = \frac{\tan a \pm \tan b}{1 \mp \tan a \tan b}$$

y	$\frac{dy}{dx}$
ax^n	nax^{n-1}
ka^x	$ka^x \ell na$
$k\ell nx$	$\frac{k}{x}$
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\cot x$	$-\operatorname{cosec}^2 x$
$\sec x$	$\sec x \tan x$
$\operatorname{cosec} x$	$-\operatorname{cosec} x \cot x$

$y = u(x) \cdot v(x)$

$$\Rightarrow \frac{dy}{dx} = u(x)v'(x) + u'(x)\,v(x)$$

$$y = \frac{u(x)}{v(x)}$$

$$\Rightarrow \frac{dy}{dx} = \frac{v(x)u'(x) - u(x)v'(x)}{[v(x)]^2}$$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$\int ax^n dx = \frac{ax^{n+1}}{n+1} + C$$

$$\int \frac{a}{x} dx = a\ell n\, x + c$$

$$\int ka^x dx = \frac{ka^x}{\ell na} + c$$

$$A_{ox} = \int_a^b y\, dx$$

$\int \sin x\, dx = -\cos x + c$

$\int \cos x\, dx = \sin x + c$

$\int \tan x\, dx = \ell n \sec x + c$

$\int \sec x\, dx = \ell n (\sec x + \tan x) + c$

4.2 Differentiate with the aid of the product rule if:

$$y = x^{\frac{1}{2}} \cdot \cos 4x$$

(4)

4.3 Differentiate with respect to x:

$$y = e^{ax} - \frac{\cos 4x}{4} - x^{\frac{1}{3}} + \ell nx - 3$$

(5)

4.4 Given:

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

Calculate, using differentiation, the coordinates of the maximum and minimum turning points. Also, distinguish between the maximum and the minimum turning points with the aid of the second derivative. (8)

[20]

QUESTION 5

5.1 5.1.1 Sketch the graph of $y = x^2 - 4$ and show the area enclosed by the x-axis, with $x = 0$ and $x = 2$. Show the representative strip 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 Simplify:

$$\int \left(3\frac{\sin x}{\cos^2 x} + \frac{2}{x} - 7 \right) dx$$

(5)

5.3 Integrate the following in terms of x:

$$\int \left(2\sin \frac{x}{2} + 2^{-x} - \frac{2}{\sqrt{x}} \right) dx$$

(4)

5.4 Evaluate:

$$\int_1^3 \left(3x^4 + 2x^3\right) dx$$

(4)

[20]

TOTAL: 100

2.3 2.3.1 Sketch the graph of $4x^2 - 9y^2 = 36$. (3)

2.3.2 What is the domain of the graph of $4x^2 - 9y^2 = 36$. (1)

2.4 Make d the subject of the formula:

$$L = \frac{1}{2} + \frac{2}{10} \ell og\left(\frac{r}{d}\right)$$ (5)

2.5 Solve for x if:

$$(3,2)^{2x+2} = (2,3)^{2x+1}$$ (5)
[20]

QUESTION 3

3.1 Derive a formula $\cos 2B$ in terms of $\cos B$ only. (3)

3.2 Determine the value of $\cos 105°$ without using a calculator. (4)

3.3 Show that:

$$\tan(90° - \theta) = \cot\theta$$ (3)

3.4 Solve for B if:

$$3\sin^2 B - 2\sin B = 1 \text{ and } 0° \leq B \leq 360°$$ (4)

3.5 Prove that:

$$(SinB + \cos B)^2 = 1 + 2\sin B\cos B$$ (3)

3.6 Simplify:

$$\sqrt{2\cos 2B + 2}$$ (3)
[20]

QUESTION 4

4.1 Determine the value of the following:

$$\lim_{x \to -z} \left(\frac{x+2}{x^2-4}\right)$$ (3)

QUESTION 1

1.1 Solve for a and b if:

$$(a+j2b)(2-j)=-5+j5$$

(4)

1.2 Given:

$$Z=\sqrt{3}-j\sqrt{2}$$

Convert $\overline{Z}$ into polar form. θ may only be positive. (2)

1.3 Given:

$$Z=\left(5\angle 22^{0}\right)^{3}$$

Simplify and leave the answer in an $a+jb$ form. (4)

1.4 Given:

$$2a+3b=14$$
$$3a-2b=-5$$

Solve for a and b using Cramer's rule. (6)

1.5 Given:

$$\begin{vmatrix} 2 & 1 & -5 \\ 1 & -1 & 1 \\ 4 & 2 & -3 \end{vmatrix}$$

Determine the following:

1.5.1 The determinant of co-efficients (2)
1.5.2 The minor of -5 (1)
1.5.3 The co-factor of -1 (1)

[20]

QUESTION 2

2.1 Sketch the graph of the inverse of:

$$y=\left(\frac{1}{3}\right)^{x}$$

(3)

2.2 Sketch the graph of $x=y^{2}$. (3)

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
MATHEMATICS N4
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Answer ALL five questions in full. Show ALL the calculations and intermediary steps. Simplify where possible
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 may 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.

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Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1430(E)(N18)T
NOVEMBER 2010

NATIONAL CERTIFICATE

MATHEMATICS N4

(16030164)

18 November (X-Paper)
09:00 – 12:00

Calculators may be used.

This question paper consists of 5 pages and a formula sheet.