



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

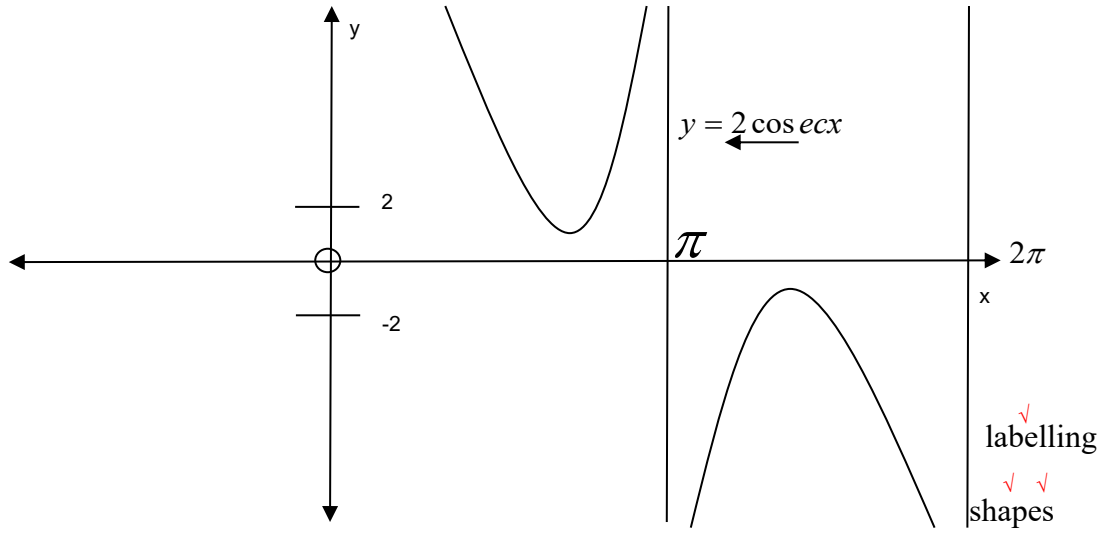
MATHEMATICS N4

7 APRIL 2016

This marking guideline consists of 8 pages.

QUESTION 1

1.1 1.1.1



(3)

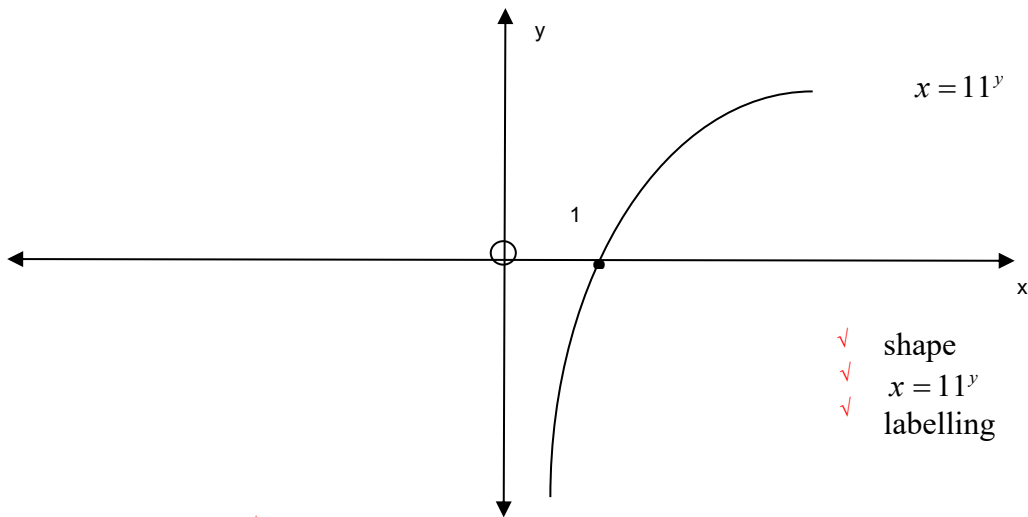
1.1.2 Function

(1)

1.1.3 Symmetrical

(1)

1.2 1.2.1



(3)

1.2.2 $(x : x = 1, x \in R)$

(2)

1.3

$$\begin{aligned}
 |Do| &= \begin{vmatrix} 1 & 1 & -1 \\ 2 & 1 & 1 \\ 1 & -1 & -\frac{1}{2} \end{vmatrix} \quad \checkmark \\
 &= 1 \begin{vmatrix} 1 & 1 \\ -1 & -\frac{1}{2} \end{vmatrix} - 1 \begin{vmatrix} 2 & 1 \\ 1 & -\frac{1}{2} \end{vmatrix} - 1 \begin{vmatrix} 2 & 1 \\ 1 & -1 \end{vmatrix} \quad \checkmark \\
 &= 1 \left(\frac{1}{2} \right) - 1(-2) - 1(-3) \quad \checkmark \\
 &= 5 \frac{1}{2} \quad \checkmark
 \end{aligned}$$

$$\begin{aligned}
 |Da| &= \begin{vmatrix} 3 & 1 & -1 \\ 3 & 1 & 1 \\ 0 & -1 & -\frac{1}{2} \end{vmatrix} \quad \checkmark \\
 &= 3 \begin{vmatrix} 1 & 1 \\ -1 & -\frac{1}{2} \end{vmatrix} - 1 \begin{vmatrix} 3 & 1 \\ 0 & -\frac{1}{2} \end{vmatrix} - 1 \begin{vmatrix} 3 & 1 \\ 0 & -1 \end{vmatrix} \quad \checkmark \\
 &= 3 \left(\frac{1}{2} \right) - 1 \left(-\frac{3}{2} \right) - 1(-3) \\
 &= 6 \quad \checkmark \\
 a &= \frac{6}{5,5} = 1,09 \quad \checkmark
 \end{aligned}$$

(8)

1.4

$$\begin{aligned}
 &\left(\frac{1}{2} \cdot \frac{1}{3} - 0 \cdot -1 \right) \quad \checkmark \\
 &= \frac{1}{6} \quad \checkmark
 \end{aligned}$$

(2)
[20]

QUESTION 2

$$\begin{aligned}
 2.1 \quad \sin 2A &= 2 \sin A \cos A \\
 &= 2 \left(\frac{7}{25} \right) \left(\frac{24}{25} \right) \quad \checkmark \quad \checkmark \\
 &= \frac{336}{625} \quad \checkmark
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 2.2 \quad 5(2 \cos^2 A - 1) - 3 \cos A + 4 &= 0 \quad \checkmark \\
 10 \cos^2 A - 3 \cos A - 1 &= 0 \quad \checkmark \\
 (2 \cos A - 1)(5 \cos A + 1) &= 0 \\
 \cos A = \frac{1}{2} \vee \cos A = -\frac{1}{5} \quad \checkmark \\
 A = 60^\circ \quad \checkmark \quad A = 180^\circ - \cos^{-1} \frac{1}{5} \\
 &= 101,537^\circ \quad \checkmark
 \end{aligned} \tag{5}$$

$$\begin{aligned}
 2.3 \quad \frac{2 \sin A + 1}{\cos A + 2 \sin A \cos A} &= \sec A \quad \checkmark \\
 \frac{2 \sin A + 1}{\cos A(1 + 2 \sin A)} &= \sec A \quad \checkmark \\
 \frac{1}{\cos A} &= \sec A \quad \checkmark
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 2.4 \quad &= \frac{\sin a \tan a \cos a}{\tan a \cdot \cos a \cdot -\sin a} \quad \checkmark \\
 &= -1 \quad \checkmark
 \end{aligned} \tag{2}$$

$$\begin{aligned}
 2.5 \quad \cos(x - y) &= \cos x \cos y + \sin x \cdot \sin y \\
 &= \frac{3}{5} \cdot \frac{5}{13} + \frac{4}{5} \cdot \frac{12}{13} \quad \checkmark \quad \checkmark \\
 &= \frac{15}{65} + \frac{48}{65} \quad \checkmark \\
 &= \frac{63}{65} \quad \checkmark
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 2.6 \quad \sqrt{2 + 2(2 \cos^2 A - 1)} &= 2 \cos A \\
 \sqrt{2 + 4 \cos^2 A - 2} &= 2 \cos A \quad \checkmark \\
 \sqrt{4 \cos^2 A} &= 2 \cos A \quad \checkmark \\
 2 \cos A &= 2 \cos A \quad \checkmark
 \end{aligned} \tag{3}$$

[20]

QUESTION 3

$$\begin{aligned}
 3.1 \quad x + y + z &= 60 \dots (1) \quad \checkmark \\
 z &= 25 \\
 \ln(1)x + y &= 35 \dots (2) \\
 x^2 + y^2 &= 625 \dots (3) \quad \checkmark \\
 \ln(3)x^2 + (35 - x)^2 &= 625 \\
 x^2 - 35x + 300 &= 0 \\
 (x - 20)(x - 15) &= 0 \quad \checkmark \\
 x_1 = 20, x_2 = 15 &\quad \checkmark \\
 \ln(2)y_1 : 20 + y &= 35 \\
 y_1 &= 15 \\
 y_2 : 15 + y &= 35 \\
 y_2 = 20 &\quad \checkmark
 \end{aligned}$$

(5)

$$\begin{aligned}
 3.2 \quad x \ln 4 &= \ln 7,25 \quad \checkmark \\
 x &= \frac{\ln 7,25}{\ln 4} \quad \checkmark \\
 x &= 1,429 \quad \checkmark
 \end{aligned}$$

(3)

$$\begin{aligned}
 3.3 \quad 1 - e^{-\frac{t}{RC}} &= \frac{i}{I_0} \quad \checkmark \\
 e^{-\frac{t}{RC}} &= \frac{I_0 - i}{I_0} \\
 \ln e^{-\frac{t}{RC}} &= \ln \left[\frac{I_0 - i}{I_0} \right] \\
 -\frac{t}{RC} &= \ln \left[\frac{I_0 - i}{I_0} \right] \quad \checkmark \\
 c &= \frac{-t}{R \ln \left[\frac{I_0 - i}{I_0} \right]} \quad \checkmark
 \end{aligned}$$

(3)

$$\begin{aligned}
 3.4 \quad & x^2 + 5x + 7 = 0 \\
 & x = \frac{-5 \pm \sqrt{(5)^2 - 4^{(1)}(7)}}{2} \quad \checkmark \\
 & x = \frac{-5 \pm \sqrt{-3}}{2} \quad \checkmark \\
 & x_1 = \frac{-5 + j\sqrt{3}}{2} \quad \checkmark \\
 & x_2 = \frac{-5 - j\sqrt{3}}{2} \quad \checkmark
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 3.5 \quad & = \frac{1}{\cos \theta - j \sin \theta} x \frac{\cos \theta + j \sin \theta}{\cos \theta + j \sin \theta} \\
 & = \frac{\cos \theta + j \sin \theta}{\cos^2 \theta + j \sin \theta \cos \theta - j \sin \theta \cos \theta - j^2 \sin^2 \theta} \quad \checkmark \\
 & = \frac{\cos \theta + j \sin \theta}{\cos^2 \theta + \sin^2 \theta} \quad \checkmark \\
 & = \cos \theta + j \sin \theta \quad \checkmark
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 3.6 \quad & \bar{z} = 3 + j6 \\
 & r = \sqrt{(3)^2 + (6)^2} \\
 & r = \sqrt{45} = 6,708 \quad \checkmark \\
 & \theta = \tan^{-1} 2 \\
 & \theta = 63,435^\circ \quad \checkmark
 \end{aligned} \tag{2}$$

[20]

QUESTION 4

$$\begin{aligned}
 4.1 \quad & \lim_{x \rightarrow \frac{1}{2}} \left[\frac{x(x-1)(x+1)}{(x-1)(x^2+x+1)} \right] \quad \checkmark \\
 &= \frac{x(x+1)}{x^2+x+1} \quad \checkmark \\
 &= \frac{\frac{1}{2} \left(\frac{1}{2} + 1 \right)}{\left(\frac{1}{2} \right)^2 + \left(\frac{1}{2} \right) + 1} \quad \checkmark \\
 &= \frac{3}{7} \quad \checkmark
 \end{aligned}$$

(4)

$$\begin{aligned}
 4.2 \quad & \frac{dy}{dx} = 3x^2 + 18x + 15 \quad \checkmark \\
 & x^2 + 6x + 5 = 0 \\
 & (x+1)(x+5) = 0 \\
 & x_1 = -1 \quad \checkmark \\
 & x_2 = -5 \quad \checkmark \\
 & y_1 = (-1)^3 + 9(-1)^2 + 15(-1) - 25 = -32 \quad \checkmark \\
 & y_2 = (-5)^3 + 9(-1)^2 + 15(-5) - 25 \\
 & \quad = 0 \quad \checkmark \\
 & \frac{d^2y}{dx^2} = 6x + 18 \\
 & x = -1, \frac{d^2y}{dx^2} > 0m \\
 & x = -5, \frac{d^2y}{dx^2} < 0M \\
 & m = (-1, -32) \& M = (-5, 0)
 \end{aligned}$$

(7)

$$4.3 \quad \frac{dy}{dx} = 2 \cos ec^2 x + \frac{6}{x} - 3 \sec x \tan x + 0 + \frac{2}{x^2} \quad \checkmark$$

(5)

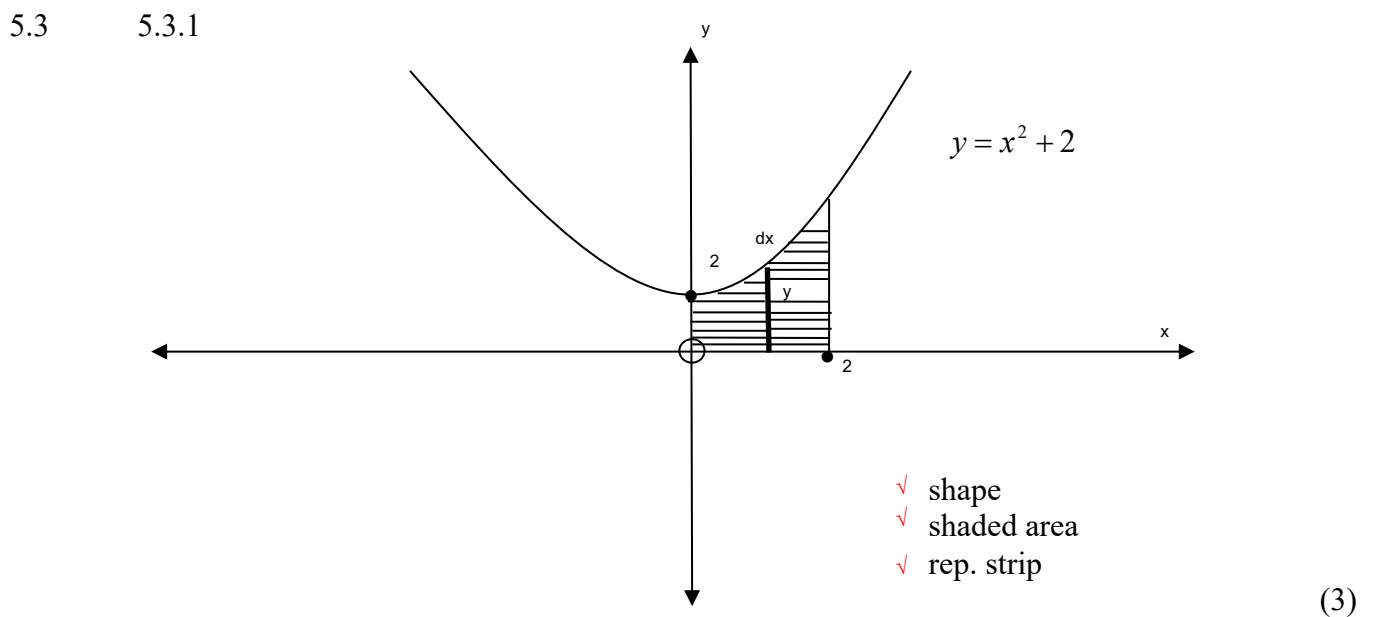
$$\begin{aligned}
 4.4 \quad & \text{Let} \\
 & u = x^{\frac{1}{2}}; u^1 = \frac{1}{2\sqrt{x}} \quad \checkmark \\
 & v = x + 4; v^1 = 1 \quad \checkmark \\
 & \frac{dy}{dx} = \frac{v \cdot u^1 - u v^1}{v^2} = \frac{(x+4) \frac{1}{2\sqrt{x}} - \sqrt{x} \cdot 1}{(x+4)^2} \quad \checkmark
 \end{aligned}$$

(4)
[20]

QUESTION 5

5.1 $\int \cos 2A \, dA \quad \checkmark$
 $\frac{\sin 2A}{2} + c \quad \checkmark \quad \checkmark$ (3)

5.2 $= [\ln 3x - \ln x]_2^4 \quad \checkmark$
 $= [\ln 3.4 - \ln 4] - [\ln 3.2 - \ln 2] \quad \checkmark$
 $= 1,504 \quad \checkmark$ (3)



5.3.2 $A_{ox} = \int_0^2 (x^2 + 2) dx \quad \checkmark$
 $= \left[\frac{x^3}{3} + 2x \right]_0^2 \quad \checkmark$
 $= \left[\frac{2^3}{3} + 2(2) \right] - [0] \quad \checkmark$
 $= 6,667 \, u^2 \quad \checkmark$ (4)

5.4 $-2 \cos x - 4\sqrt{x} - 3x + \frac{x}{a} - 9 \sin \frac{x}{3} + \frac{3^{-4x}}{4} + c$ (7)
 $\checkmark \quad \checkmark \quad \checkmark \quad \checkmark \quad \checkmark \quad \checkmark \quad \checkmark$ [20]

TOTAL: 100