



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

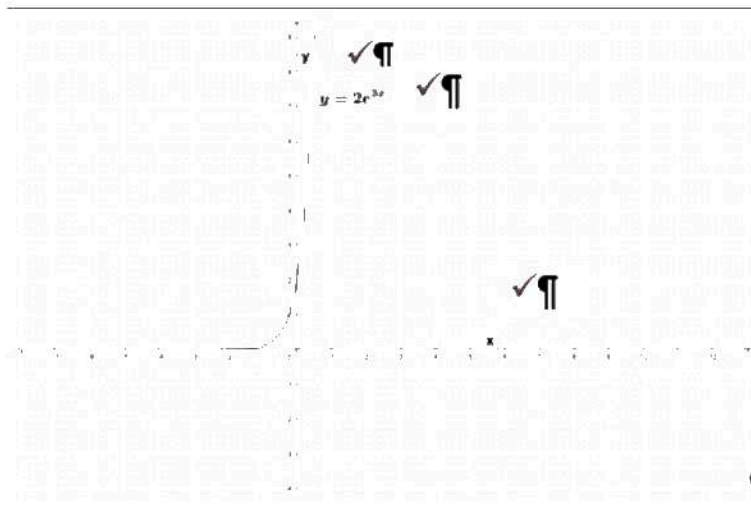
MATHEMATICS N4

20 November 2024

This marking guideline consists of 7 pages.

QUESTION 1

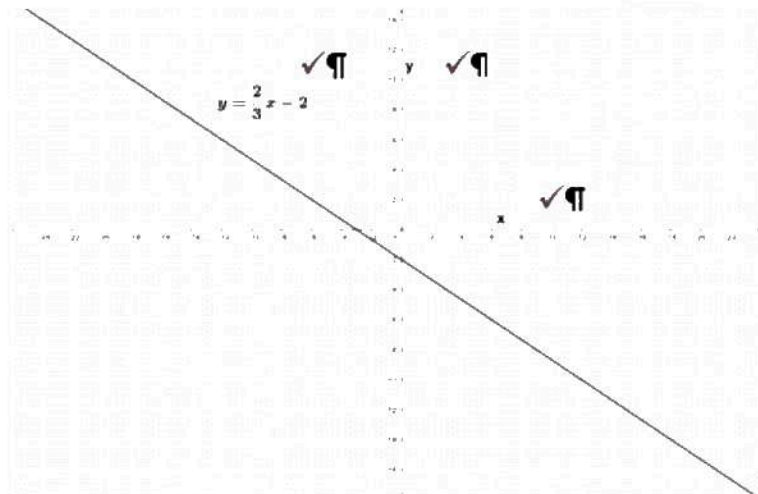
1.1



(3)

1.2

1.2.1



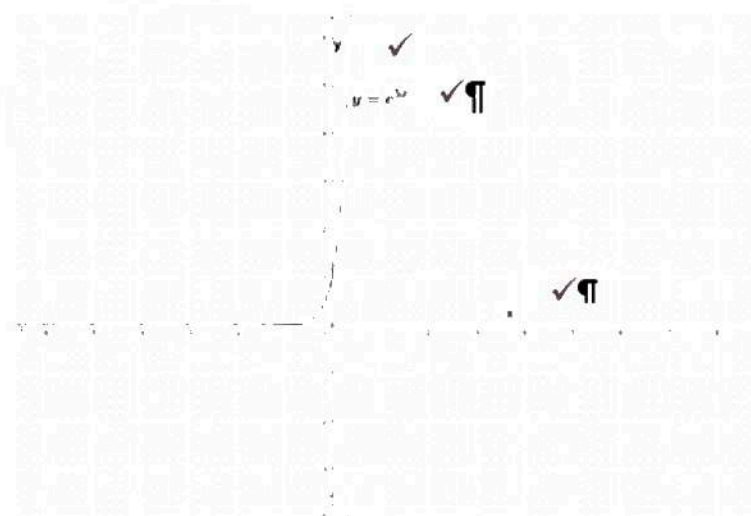
(3)

1.2.2

Function. ✓

(1)

1.3



(3)
[10]

QUESTION 2

$$2.1 \quad -18 + 3j - 12j + 2j^2 = -2x + 4jx - 2yj + 4yj^2 \checkmark$$

$$-20 - 9j = -2x + 4xj - 4y \checkmark$$

$$-2x - 4y = -20 \dots \dots \dots (1) \checkmark \times 2$$

$$4x - 2y = -9 \dots \dots \dots (2) \times 1$$

$$-40 = -4x - 8y \dots \dots \dots (3)$$

$$\text{ADD (2) and (3)} \Leftrightarrow -49 = -10y$$

$$\therefore y = \frac{49}{10} \checkmark$$

$$4x = -9 + 2y$$

$$x = \frac{-9 + 2\left(\frac{49}{10}\right)}{4}$$

$$\therefore x = \frac{1}{5} \checkmark$$

(5)

2.2

$$2.2. = \frac{90^\circ}{45^\circ \cdot 30^\circ} \checkmark$$

$$= 90^\circ - 75^\circ \checkmark$$

$$= 15^\circ \checkmark$$

(3)

2.3

$$|r| = \sqrt{(7)^2 + (12)^2}$$

$$= \sqrt{170} / 13,04 \checkmark$$

$$\tan \theta = \frac{12}{7}$$

$$\theta = \tan^{-1}\left(\frac{12}{7}\right)$$

$$\theta = 59,74^\circ \checkmark$$

$$\therefore \theta = 360^\circ - 59,74^\circ$$

$$= 300,26^\circ \checkmark$$

$$\therefore \sqrt{170}(\cos 300,26^\circ + i \sin 300,26^\circ) \checkmark$$

(4)

$$\begin{aligned}
 2.4 \quad \Delta_0 &= 2 \begin{vmatrix} -2 & 2 \\ 1 & 1 \end{vmatrix} + \begin{vmatrix} 1 & 2 \\ 3 & 1 \end{vmatrix} + \begin{vmatrix} 1 & -2 \\ 3 & 1 \end{vmatrix} \checkmark \\
 &= 2(-4) - 5 + 7 \checkmark \\
 &= 2 \checkmark \\
 \Delta_z &= 2 \begin{vmatrix} -2 & 6 \\ 1 & 8 \end{vmatrix} + \begin{vmatrix} 1 & 6 \\ 3 & 8 \end{vmatrix} + 4 \begin{vmatrix} 1 & -2 \\ 3 & 1 \end{vmatrix} \checkmark \\
 &= 2(-22) - 10 + 4(7) \checkmark \\
 &= -26 \checkmark \\
 \therefore \frac{\Delta_z}{\Delta_0} &= \frac{-26}{2} = 2 \checkmark \checkmark
 \end{aligned}$$

(8)
[20]

QUESTION 3

$$\begin{aligned}
 3.1 \quad \sin(x - 20^\circ) &= \cos(20^\circ + x) \quad \checkmark \\
 \sin(x - 20^\circ) &= \sin[90^\circ - (20^\circ + x)] \quad \checkmark \\
 x - 20^\circ &= 70^\circ - x \quad \checkmark \\
 2x &= 90^\circ \quad \checkmark \\
 x &= 45^\circ \quad \checkmark
 \end{aligned}$$

(5)

$$\begin{aligned}
 3.2 \quad \frac{\cos x}{1 - \sin x} - \frac{\cos x}{1 + \sin x} \\
 &= \frac{\cos x(1 + \sin x) - \cos x(1 - \sin x)}{1 - \sin^2 x} \quad \checkmark \\
 &= \frac{2 \sin x \cdot \cos x}{\cos^2 x} \quad \checkmark \\
 &= 2 \tan x \quad \checkmark
 \end{aligned}$$

(5)

$$\begin{aligned}
 3.3 \quad LHS &= \frac{\sin 2x - \sin x}{\cos 2x + \cos x} \\
 &= \frac{2 \sin x \cdot \cos x - \sin x}{\cos^2 x - \sin^2 x + \cos x} \quad \checkmark \\
 &= \frac{\sin x(2 \cos x - 1)}{2 \cos^2 x + \cos x - 1} \quad \checkmark \\
 &= \frac{\sin x(2 \cos x - 1)}{(2 \cos x - 1)(\cos x + 1)} \quad \checkmark \quad \checkmark \\
 &= \frac{\sin x}{\cos x + 1} \quad \checkmark \\
 &= RHS
 \end{aligned}$$

(5)

3.4

$$\begin{aligned}\tan 15^\circ &= \frac{1}{1 + \frac{\sqrt{3}}{2}} \checkmark \\ &= \frac{\frac{1}{2}}{\frac{2 + \sqrt{3}}{2}} \checkmark \\ &= \frac{1}{2} \times \frac{2}{2 + \sqrt{3}} \checkmark \\ &= \frac{1}{2 + \sqrt{3}} \checkmark\end{aligned}$$

(5)
[20]

QUESTION 4

4.1

$$\begin{aligned}\lim_{x \rightarrow \infty} \left(\frac{2x^3 - x^2 + 3x + 9}{5x^3 + 3x^2 - 4} \right) \\ \lim_{x \rightarrow \infty} = \left(\frac{\frac{2x^3}{x^3} - \frac{x^2}{x^3} + \frac{3x}{x^3} + \frac{9}{x^3}}{\frac{5x^3}{x^3} + \frac{3x^2}{x^3} - \frac{4}{x^3}} \right) \checkmark \\ \lim_{x \rightarrow \infty} = \left(\frac{2 - \frac{1}{x} + \frac{3}{x^2} + \frac{9}{x^3}}{5 + \frac{3}{x} - \frac{4}{x^3}} \right) \checkmark \\ \lim_{x \rightarrow \infty} = \left(\frac{2 - \frac{1}{\infty} + \frac{3}{\infty^2} + \frac{9}{\infty^3}}{5 + \frac{3}{\infty} - \frac{4}{\infty^3}} \right) \checkmark \\ = \frac{2}{5} \checkmark \checkmark\end{aligned}$$

(5)

4.2

$$\frac{dy}{dx} = 3y^2 + 2e^{2y} - 2\sin 2y - \frac{2}{y} + 0$$

(5)

$$\begin{aligned}
 4.3 \quad & y = \ln u & u = kx \\
 & \frac{dy}{du} = \frac{1}{u} \quad \checkmark & \frac{du}{dx} = k \quad \checkmark \\
 & \therefore \frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx} \\
 & = \frac{1}{u} \times k \quad \checkmark \\
 & = \frac{1}{x} \quad \checkmark \checkmark
 \end{aligned}
 \tag{5}$$

$$4.4 \quad \frac{dy}{dx} = \frac{e^x \cdot \sec x - e^x \cdot \sec x \cdot \tan x}{\sec^2 x} \tag{5}$$

$$\begin{aligned}
 4.5 \quad & \frac{dy}{dx} = 3x^2 - 4x - 8 \quad \checkmark \\
 & \frac{d^2y}{dx^2} = 6x - 4 \quad \checkmark \\
 & \frac{d^2y}{dx^2} = 0 \quad \therefore 6x - 4 = 0 \quad \therefore x = \frac{2}{3} \quad \checkmark \\
 & y = \left(\frac{2}{3}\right)^3 - 2\left(\frac{2}{3}\right)^2 - 8\left(\frac{2}{3}\right) = -5,93 \quad \therefore \text{the points of inflection } (0,667; -5,93) \quad \checkmark \checkmark
 \end{aligned}
 \tag{5}$$

[20]

QUESTION 5

$$5.1 \quad = \frac{-\cos 2x}{2} - 3 \cot x + e^{3x} + kx + c \quad \checkmark \checkmark \checkmark \checkmark \checkmark \tag{5}$$

$$\begin{aligned}
 5.2 \quad & = \left[2 \ln \sec x \right]_0^{\frac{\pi}{4}} \quad \checkmark \\
 & = 2 \left[\ln \sec \left(\frac{\pi}{4} \right) - \ln \sec(0) \right] \quad \checkmark \\
 & = 2 \left(\ln \left(\frac{1}{\sqrt{2}} \right) - 0 \right) \quad \checkmark \\
 & = -0,693 \quad \checkmark
 \end{aligned}
 \tag{4}$$

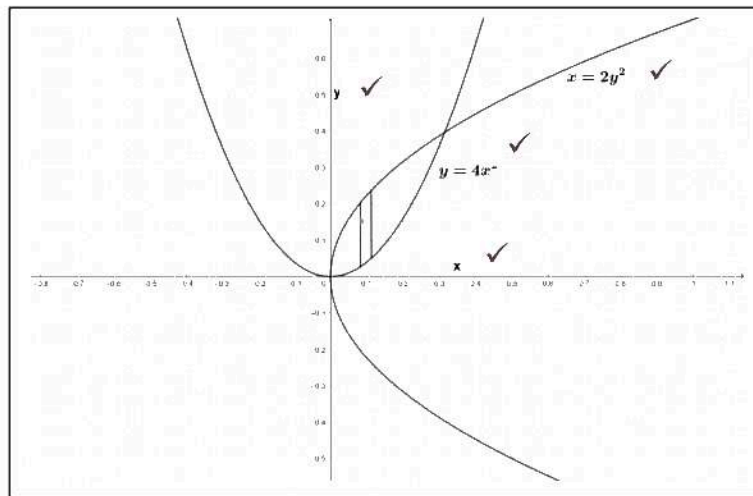
5.3

$$\begin{aligned} & \frac{3}{2} \int \frac{(x-3)(x^2+3x+9)}{(x-3)} \\ &= \frac{3}{2} \int (x^2+3x+9) dx \checkmark \checkmark \\ &= \frac{3}{2} \left[\frac{x^3}{3} + \frac{3x^2}{2} + 9x \right] + c \checkmark \\ &= \frac{x^3}{2} + \frac{9x^2}{4} + \frac{27}{2}x + c \checkmark \end{aligned}$$

(6)

5.4

5.4.1



✓ for area
✓ for strip

(6)

5.4.2

$$\begin{aligned} A &= \int_{x_1}^{x_2} (y_2 - y_1) dx \\ &= \int_0^{0.3} \left(\frac{1}{\sqrt{2}} x^{\frac{1}{2}} - 4x^2 \right) dx \checkmark \\ &= \left[\frac{3}{2\sqrt{2}} x^{\frac{3}{2}} - \frac{4}{3} x^3 + c \right]_0^{0.3} \checkmark \\ &= \frac{3}{2\sqrt{2}} (0.3)^{\frac{3}{2}} - \frac{4}{3} (0.3)^3 - (0) \checkmark \\ &= 0,138u^2 \checkmark \end{aligned}$$

(4)

[25]

TOTAL: 100