



**higher education  
& training**

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

# **MARKING GUIDELINE**

**NATIONAL CERTIFICATE**

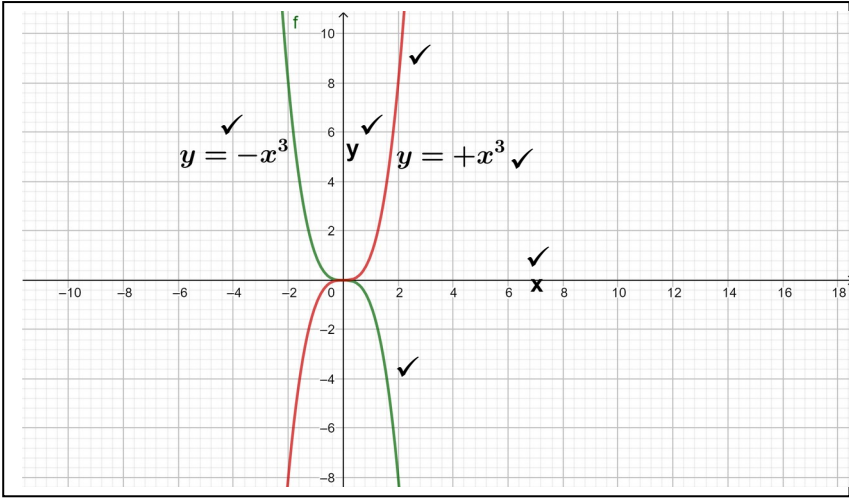
**MATHEMATICS N4**

**30 March 2023**

**This marking guideline consists of 8 pages.**

QUESTION 1

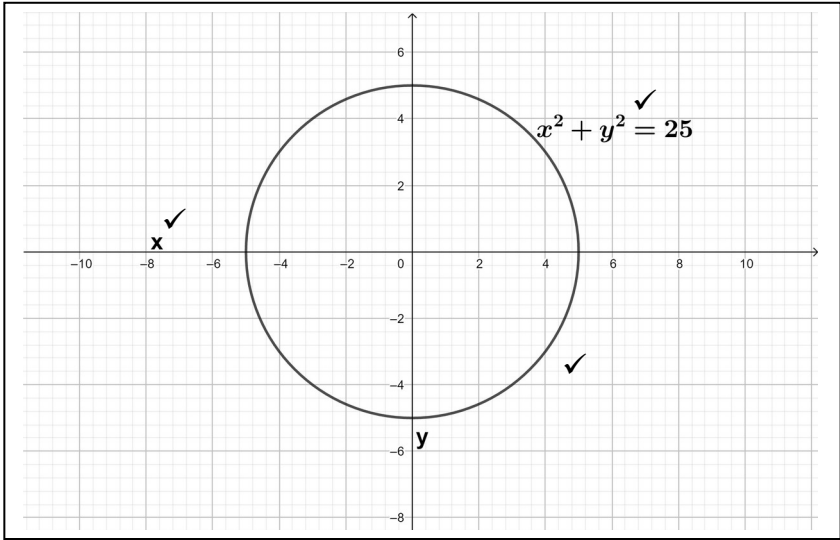
1.1



- ✓✓ for shape
- ✓✓ for naming
- ✓ for x-axis
- ✓ for y-axis

(6)

1.2



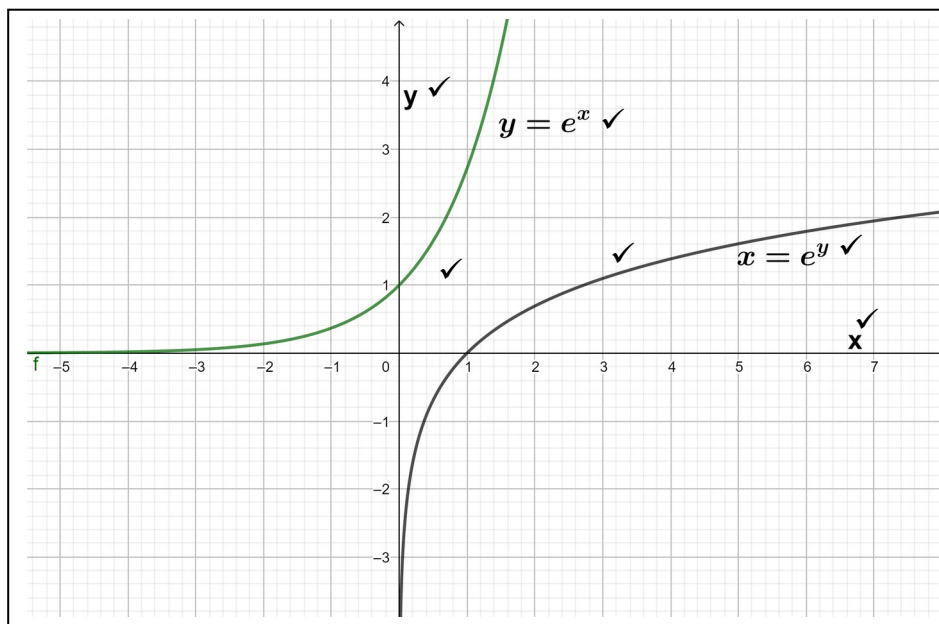
- ✓ for naming
- ✓ for shape
- ✓ for x-axis
- ✓ for y-axis

(4)

- 1.2.1      Relation ✓✓  
1.2.2      Yes ✓✓

(2 × 2)      (4)

1.3



✓✓ for shape  
 ✓✓ for naming  
 ✓ for x-axis  
 ✓ for y-axis

(6)  
 [20]

**QUESTION 2**

2.1

$$|r| = \sqrt{(-4)^2 + (-3)^2}$$

$$= \sqrt{25}$$

$$= 5 \checkmark$$

$$\tan \theta = \frac{y}{x} = \frac{-4}{-3} = 1,333$$

$$\theta = \tan^{-1}(1,333)$$

$$= 53^\circ$$

$$\therefore \theta = 233^\circ \checkmark$$

$$(5 \mid 223^\circ)^3$$

$$125 \mid 699^\circ$$

$$\therefore 125(\cos 699^\circ + i \sin 699^\circ) \checkmark$$

$$= 166,698 - i 44,796 \checkmark$$

(4)

2.2

$$\frac{12 \mid 30^\circ + 40^\circ}{6 \mid 40^\circ} \checkmark$$

$$= \frac{12 \mid 70^\circ}{6 \mid 20^\circ} \checkmark$$

$$= 2 \mid 70^\circ - 20^\circ \checkmark$$

$$= 2 \mid 50^\circ \checkmark$$

(4)

2.3

$$\Delta_0 = \begin{vmatrix} 1 & 2 & 1 \\ 3 & -4 & -2 \\ 2 & 5 & -2 \end{vmatrix}$$

$$\begin{aligned} &= (8+10) - 2(-6+4) + (15+8) \checkmark \\ &= 18+4+23 \checkmark \\ &= 45 \checkmark \end{aligned}$$

$$\begin{aligned} \Delta_{1/x} &= \begin{vmatrix} 2 & 2 & 1 \\ 1 & -4 & -2 \\ 3 & 5 & -2 \end{vmatrix} \\ &= 2(8+10) - 2(-2+6) + (5+12) \checkmark \\ &= 45 \checkmark \end{aligned}$$

$$\begin{aligned} \therefore \frac{1}{x} &= \frac{\Delta_{1/x}}{\Delta_0} = \frac{45}{45} = 1 \checkmark \\ \therefore x &= 1 \checkmark \end{aligned}$$

(7)

2.4

$$\begin{aligned} x+2y &= -4 \\ 5x+3y &= 1 \end{aligned}$$

$$\Delta_0 = \begin{vmatrix} 1 & 2 \\ 5 & 3 \end{vmatrix} = 3 - 10 = -7 \checkmark$$

$$\Delta_x = \begin{vmatrix} -4 & 2 \\ 1 & 3 \end{vmatrix} = -12 - 2 = -14 \checkmark$$

$$\Delta_y = \begin{vmatrix} 1 & -4 \\ 5 & 1 \end{vmatrix} = 1 + 20 = 21 \checkmark$$

$$\therefore x = \frac{\Delta_x}{\Delta_0} = \frac{-14}{-7} = 2 \checkmark$$

$$\therefore y = \frac{\Delta_y}{\Delta_0} = \frac{21}{-7} = -3 \checkmark$$

(5)  
[20]

**QUESTION 3**

$$\begin{aligned}
 3.1 \quad & \sin^2 x \left( \frac{1}{1+\cos x} + \frac{1}{1-\cos x} \right) \\
 &= \frac{\sin^2 x}{1+\cos x} + \frac{\sin^2 x}{1-\cos x} \checkmark \\
 &= \frac{\sin^2 x + \sin^2 x}{(1+\cos x)(1-\cos x)} \checkmark \\
 &= \frac{2\sin^2 x}{1-\cos^2 x} \checkmark \\
 &= \frac{2\sin^2 x}{\sin^2 x} \checkmark \\
 &= 2 \checkmark
 \end{aligned}
 \tag{5}$$

$$\begin{aligned}
 3.2 \quad & \frac{-\operatorname{cosec} x \cdot -\cot x \cdot \sin x}{\sec x \cdot \sin x \cdot \cot^2 x} \checkmark \\
 &= \frac{-\frac{1}{\sin x} \cdot -\frac{\cos x}{\sin x} \cdot \sin x}{\frac{1}{\cos x} \cdot \sin x \cdot \frac{\cos^2 x}{\sin^2 x}} \checkmark \\
 &= \frac{\frac{\cos x}{\sin x}}{\frac{\sin x}{\cos x}} \checkmark \\
 &= \frac{\cos x}{\sin x} \times \frac{\sin x}{\cos x} \\
 &= 1 \checkmark
 \end{aligned}
 \tag{4}$$

$$\begin{aligned}
 3.3 \quad & 2\cos^2 2\theta + \cos \theta - 1 = 0 \\
 & (2\cos \theta - 1)(\cos 2\theta + 1) = 0 \checkmark \\
 & 2\cos 2\theta - 1 = 0 \quad \text{or} \quad \cos 2\theta + 1 = 0 \checkmark \\
 & \text{ref } \angle = 60^\circ \checkmark \\
 & \therefore 2\theta = 60^\circ; 300^\circ \checkmark \\
 & \therefore \theta = 30^\circ; 150^\circ \checkmark \\
 & \therefore \text{GS}[-150^\circ; -30^\circ; 30^\circ; 150^\circ] \checkmark \checkmark
 \end{aligned}
 \tag{7}$$

3.4

$$\cos(60^\circ - 45^\circ) = \frac{\sqrt{2} + \sqrt{6}}{4}$$

$$\begin{aligned} \text{LHS} &= \cos(60^\circ - 45^\circ) \\ &= \cos 60^\circ \cdot \cos 45^\circ + \sin 60^\circ \cdot \sin 45^\circ \checkmark \\ &= \frac{1}{2} \cdot \frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2} \cdot \frac{1}{\sqrt{2}} \checkmark \\ &= \frac{1}{2\sqrt{2}} + \frac{\sqrt{3}}{2\sqrt{2}} \\ &= \frac{1+\sqrt{3}}{2\sqrt{2}} \times \frac{2\sqrt{2}}{2\sqrt{2}} \checkmark \\ &= \frac{2\sqrt{2} + 2\sqrt{6}}{8} \\ &= \frac{2(\sqrt{2} + \sqrt{6})}{8} \\ &= \frac{\sqrt{2} + \sqrt{6}}{4} \checkmark \\ &= \text{RHS} \end{aligned}$$

(4)



**QUESTION 4**

4.1

$$\begin{aligned}\lim_{x \rightarrow 4} \left( \frac{\sqrt{x}-2}{x-4} \right) \\&= \frac{(\sqrt{x}-2)}{(\sqrt{x}-2)(\sqrt{x}+2)} \checkmark \\&= \frac{1}{\sqrt{4}+2} \checkmark \\&= \frac{1}{4} \checkmark\end{aligned}$$

(3)

4.2

$$y = \frac{\tan x}{\ln x}$$

$$\frac{dy}{dx} = \frac{\sec^2 x (\ln x) - \tan x \left( \frac{1}{x} \right)}{(\ln x)^2}$$

(3)

$$4.3 \quad \frac{dy}{dx} = \left( \frac{1}{x^2} \cdot 2x \right) (\ln^2 x) + \ln x^2 \left( 2 \ln x \cdot \frac{1}{x} \right) \quad (5)$$

$$4.4 \quad \frac{dy}{dx} = 3 \cos 3x - \sec^2 x + \sqrt{2}e^x - 2 \cdot 6^{2x} \ln 6 + 0 \quad (5)$$

4.5

$$f(x) = 9x^2 + 18x + 3$$

$$f''(18x + 18)$$

since :  $\frac{d^2y}{dx^2} = 0$ ;

$$\therefore 18x + 18 = 0 \checkmark$$

$$\therefore x = -1 \checkmark$$

$$\therefore y = 3(-1)^2 + 9(-1) + 3(-1) + 7$$

$$= 10 \checkmark$$

$\therefore$  Points of inflection:  $(-1; 10) \checkmark$

(4)  
[20]

## QUESTION 5

5.1      5.1.1

$$\left[ \frac{t^3}{3} + t^2 + t + c \right]_0^1 \checkmark$$

$$= \frac{(1)^3}{3} + (1)^2 + 1 + c - \left( \frac{(0)^3}{3} + (0)^2 + 0 + c \right) \checkmark \checkmark$$

$$= \frac{7}{3} \text{ or } 2.333 \checkmark$$

(4)

5.1.2

$$\int \frac{\sin 2\theta}{\cos \theta} d\theta$$

$$= \int \frac{2 \sin \theta \cdot \cos \theta}{\cos \theta} \checkmark \checkmark$$

$$= -2 \cos \theta + c \checkmark$$

(3)

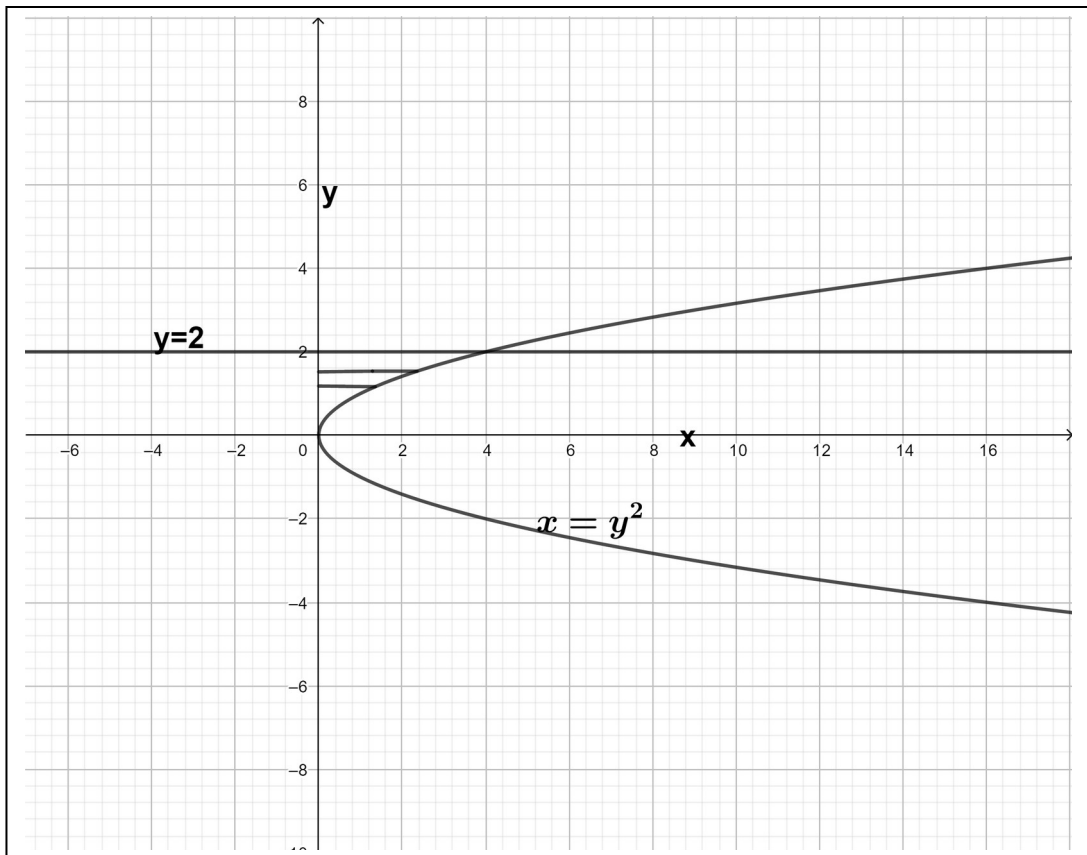
5.2

$$= \frac{-2}{x} + 3 \ln x + 4 \ln(\sec x) + 3 \tan x + c \checkmark$$

(5)

5.3

5.3.1



(4)

5.3.2

$$\begin{aligned}
 A_y &= \int_{y_1}^{y_2} (x_2 - x_1) dx \\
 &= \int_0^2 (y^2 - 0) dx \quad \checkmark \\
 &= \left[ \frac{y^3}{3} \right]_0^2 \quad \checkmark \\
 &= \frac{2^3}{3} - \frac{(0)^3}{3} \quad \checkmark \\
 &= \frac{8}{3} \text{ or } 2,667 \text{ units}^2 \quad \checkmark
 \end{aligned}$$

1 ✓ for graph  
 1 ✓ for  $y=2$   
 1 ✓ for area  
 1 ✓ for representative strip

(4)  
[20]**TOTAL: 100**