higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MATHEMATICS N4

27 JULY 2021

This marking guideline consists of 8 pages.

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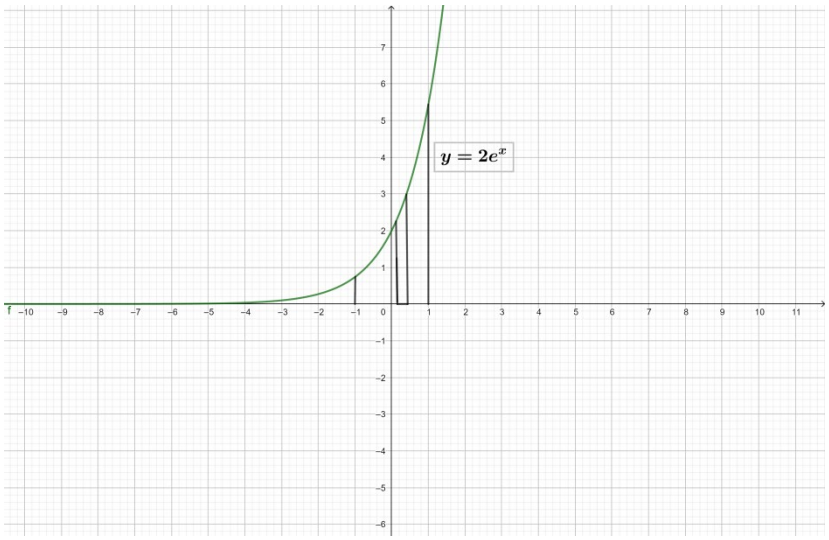
QUESTION 1

1.1 $$-2\cos ecx + 7\cot x + \frac{4}{3}\frac{\pi^{3x}}{\ln \pi} + \frac{e^{-4x}}{3\ln e} + \sec x + \frac{7}{8}\pi x + c$$ ✓✓✓✓✓✓✓ (7)

1.2
$$\int\left(\frac{7\cos^2 x.\sin x + 9}{\cos^2 x}\right)dx$$
$$= \int\left(\frac{7\cos^2 x.\sin x}{\cos^2 x} + \frac{9}{\cos^2 x}\right)dx$$
$$= \int\left(7\sin x + 9\sec^2 x\right)dx$$
$$= -7\cos x + 9\tan x + c$$ ✓✓✓✓✓ (5)

1.3 1.3.1



✓✓for correct area, ✓ for the strip, ✓for graph (4)

1.3.2
$$\int_{-1}^{1} 3e^x dx$$
$$= \left[3e^x + c\right]_{-1}^{1}$$
$$= 3e^1 + c - \left(3e^{-1} + c\right)$$ ✓✓✓✓
$$= 3e - \frac{3}{e}$$
$$= 7{,}051u^2$$

Alternative method

$$\int_{-1}^{1} 3e^x dx$$

$$\left[3e^x\right]_{-1}^{0} + \left[3e^x\right]_{0}^{1}$$

$$= 3e^0 - 3e^{-1} + 3e^1 - 3e^0$$

$$= 3 - \frac{3}{e} + 3e - 3$$

$$= 7.051u^2$$ (4)

[20]

QUESTION 2

2.1 $$\sin 2x = \cos\left(\frac{x}{2}\right)$$

$$\sin\left(90^0 - 2x\right) = \cos\left(\frac{x}{2}\right)$$

$$90^0 - 2x = \frac{x}{2}$$

$$\frac{5}{2}x = 90^0$$

$$x = 36^0$$

Alterntive – Method

$$\sin 2x = \cos\left(90^0 - \frac{x}{2}\right)$$

$$\sin 2x = \sin\left(90^0 - \frac{x}{2}\right)$$

$$\frac{5}{2}x = 90^0$$ ✓✓✓✓✓

$$x = 36^0$$ (5)

2.2 $\dfrac{\tan x}{\sec x-1}+\dfrac{\tan x}{\sec x+1}=\dfrac{2}{\cos x}$

$$\text{LHS}=\frac{\tan x(\sec x+1)+\tan x(\sec x-1)}{(\sec x-1)(\sec x+1)}$$

$$=\frac{\tan x\sec x+\tan x+\tan x.\sec x-\tan x}{\sec^2 x-1}$$

$$=\frac{2\tan x.\sec x}{\tan x}$$ ✓✓✓✓✓

$$=2\sec x$$

$$=\frac{2}{\cos x}$$

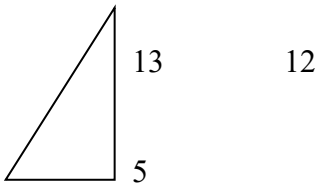
$$=\text{RHS}$$ (5)

2.3 $\dfrac{-\sin^2\theta-\cos\theta.\sec\theta}{-\tan\theta.\cot\theta}$

$$=\frac{\sin^2\theta.\cos\theta.\dfrac{1}{\cos\theta}}{-\dfrac{1}{\cot}.\cot\theta}$$ ✓✓✓✓✓

$$=\sin^2\theta+1$$ (5)

2.4



$r^2=12^2+5^2$

$r^2=169$

$r=13$

$5\sin x+12\cos x$ ✓✓✓✓✓

$$=5.\frac{5}{13}+12.\frac{12}{13}$$

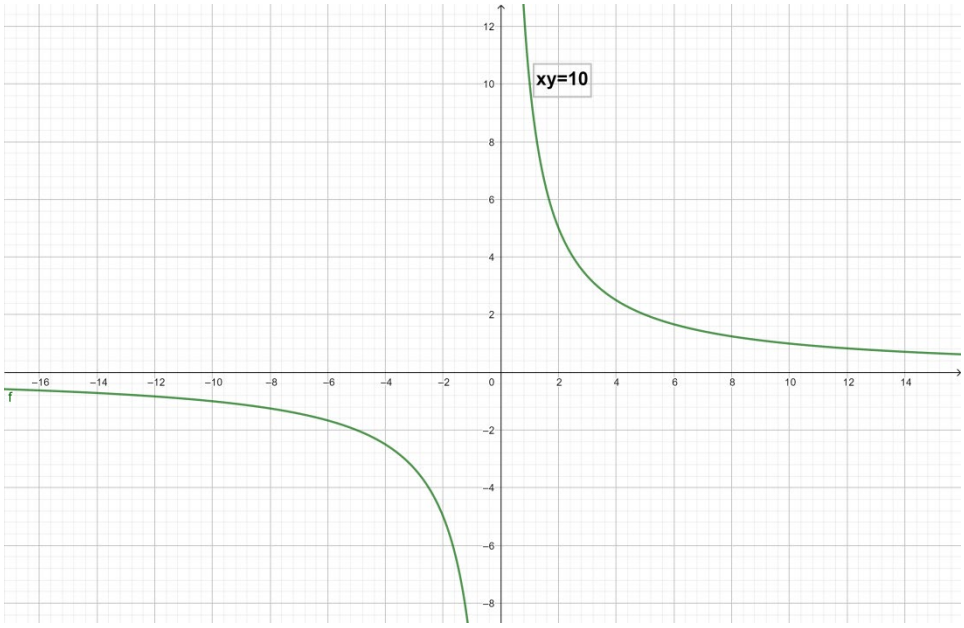
$$=\frac{25}{13}+\frac{144}{13}$$

$$=13$$ (5)

[20]

QUESTION 3

3.1



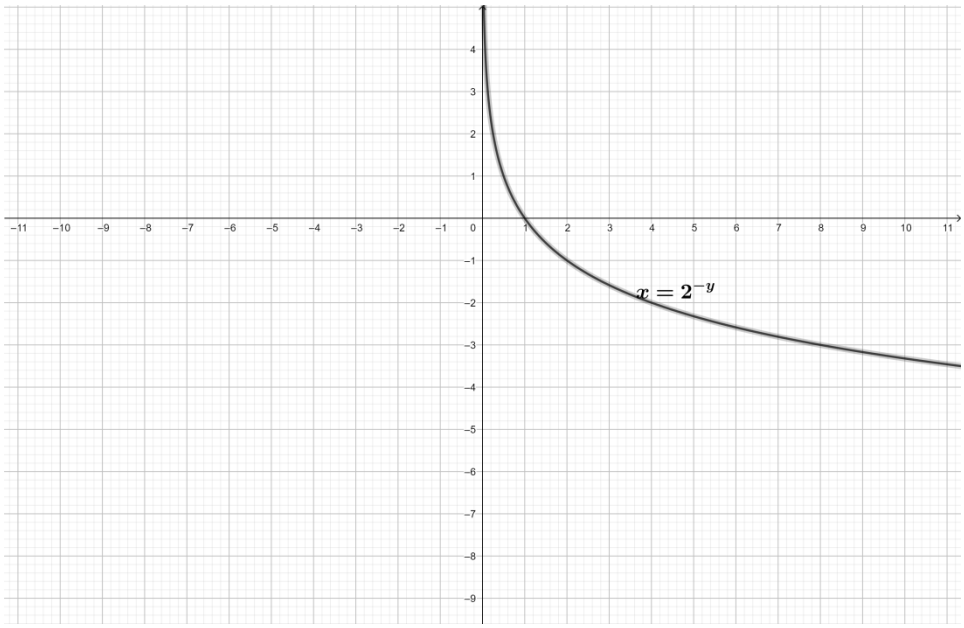
✓ for *x-axis*, ✓ for *y-axis*, ✓ for graph (3)

3.1.1 Asymmetrical

3.1.2 Discontinuous

(2 × 1) (2)

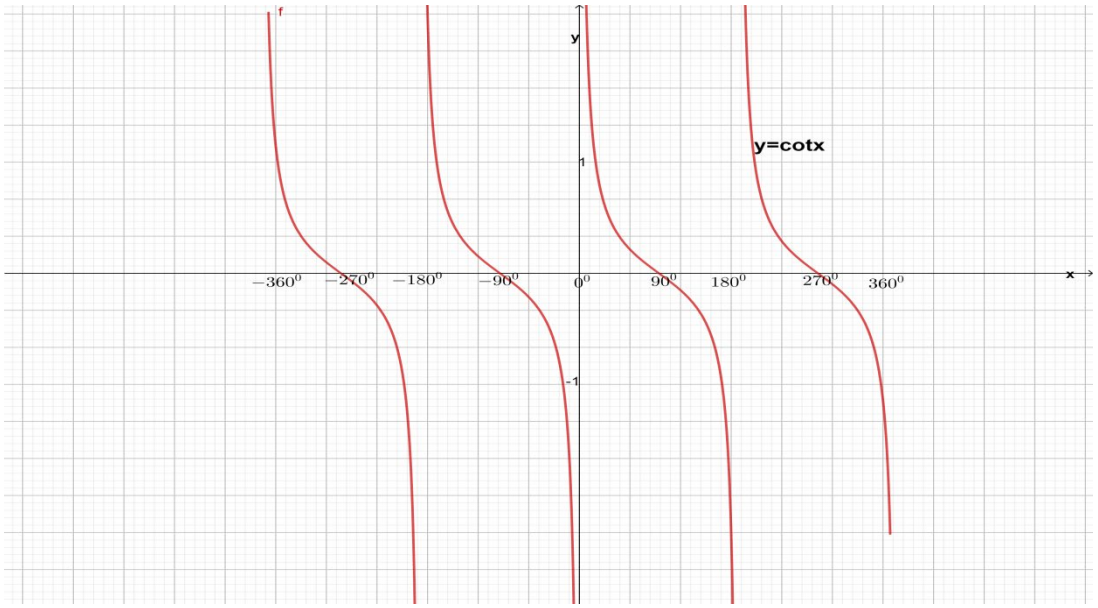
3.2



✓ for *x-axis*, ✓ for *y-axis*, ✓ for graph (3)

3.2.1 Continuous (1)

3.3



Two marks for correct period $\left(-360^0;360^0\right)$, one mark for naming the graph and one mark for shape✓✓✓✓ (4)

3.4

$$3^{2x+1} = \ln(3)$$
$$\ln 3(2x+1) = 0{,}094$$
$$2{,}197x + 1{,}099 = 0{,}094 \checkmark\checkmark\checkmark$$
$$2{,}197x = -1{,}005$$
$$x = -0{,}457$$

(3)

3.5

$$\sqrt[4]{x^3} - \frac{9}{8\sqrt[4]{x}} - \frac{27}{128\sqrt[4]{x^5}} - \frac{405}{3072\sqrt[4]{x^9}} \checkmark\checkmark\checkmark\checkmark$$

(4)
[20]

QUESTION 4

4.1 4.1.1

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

$$D = \begin{vmatrix} 3 & -2 \\ -3 & -1 \end{vmatrix} - 2\begin{vmatrix} 2 & -2 \\ -2 & -1 \end{vmatrix} + 3\begin{vmatrix} 2 & 3 \\ -2 & -3 \end{vmatrix}$$

$$= -9 + 12 + 0 \quad \checkmark\checkmark\checkmark\checkmark$$

$$= 3 \quad (4)$$

4.1.2

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

$$= 3 - 4 \checkmark\checkmark$$

$$= -1 \quad (2)$$

4.1.3

$$(-1)^{3+2}\begin{vmatrix} 1 & 3 \\ 2 & -2 \end{vmatrix}$$

$$= -(-2-6) \checkmark\checkmark$$

$$= 8 \quad (2)$$

4.2 4.2.1

$$\bar{Z} = -2 + j\sqrt{6} \quad (1)$$

4.2.2

$$|r| = \sqrt{(-2)^2 + (\sqrt{6})^2} \quad \checkmark\checkmark$$

$$= \sqrt{4+6}$$

$$= \sqrt{10} \quad (2)$$

4.2.3

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

$$= \frac{-\sqrt{6}}{-2}$$

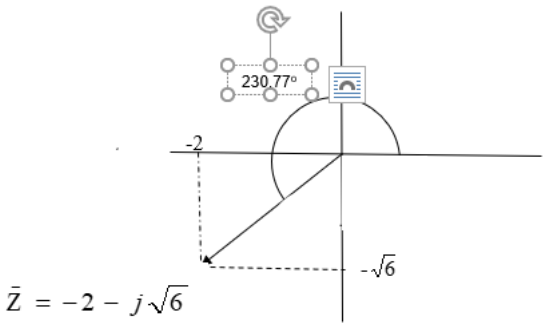
$$= 50{,}77^0 \quad \checkmark\checkmark\checkmark\checkmark$$

$$\theta = 180^0 + 50{,}77$$

$$\theta = 230.77^0$$

$$\sqrt{10}(\cos 230{,}77^0 + i\sin 230{,}77^0) \quad (4)$$

4.2.4



4.3 $(j^2)^9.j$
$= (-1)^9.j$
$= -j$ √√

(2)
[20]

QUESTION 5

5.1
$$\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$
$$=\frac{a(x+h)^2+b(x+h)+c-(ax^2+bx+c)}{h}$$
$$=\frac{ax^2+2axh+ah^2+bx+bh+c-ax^2-bx-c}{h}\ \checkmark\checkmark\checkmark\checkmark\checkmark$$
$$=\frac{h(2ax+ah+b)}{h}$$
$$\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}=2ax+b$$
(5)

5.2
$$\frac{dy}{dx}=\sec x.\tan x(\tan x)+(\sec x).\sec^2 x\ \checkmark\checkmark\checkmark$$
$$=\sec x.\tan^2 x+\sec^3 x$$
(3)

5.3
$$\frac{dy}{dx}=-2\sec^2 x-3x^{\frac{-5}{3}}+5\cos ecx.\cot x-3.4^{-3x}.\ln 4-\frac{-3}{7}e^{-3x}.\ln e\ \checkmark\checkmark\checkmark\checkmark\checkmark$$
(5)

5.4

[20]

TOTAL: 100

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