



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MATHEMATICS N4

28 MARCH 2018

This marking guideline consists of 9 pages.

QUESTION 1

1.1

$$\int (x) = 3x^2 + 10x + 2$$

$$0 = 3x^2 + 10x + 2 \quad \checkmark$$

$$x = \frac{10 \pm \sqrt{76}}{6} \quad \checkmark$$

$$x_1 = 0,214; x_2 = 3,12 \quad \checkmark$$

$$y_1 = (0,214)^3 + 5(0,214)^2 + 2(0,214) - 8 = 8,209 \quad \checkmark$$

$$y_2 = (3,12)^3 + 5(3,12)^2 + 2(3,12) - 8 = 4,061 \quad \checkmark$$

$$TPS : (0,214; 8,209); (3,12; 4,061)$$

$$P.O.I. : \frac{d^2y}{dx^2} = 6x + 10$$

$$x = \frac{5}{3} \quad \checkmark$$

$$y = \left(\frac{5}{3}\right)^3 + 3\left(\frac{5}{3}\right)^2 + 2\left(\frac{5}{3}\right) - 8 = 2,074 \quad \checkmark$$

$$P.O.I. : \left(\frac{5}{3}; 2,074\right)$$

$$\frac{d^2y}{dx^2} = 6x + 10$$

$$\text{At } x = 0,214 : \frac{d^2y}{dx^2} = 6(0,214) + 10 = 8,71870 \text{ m}$$

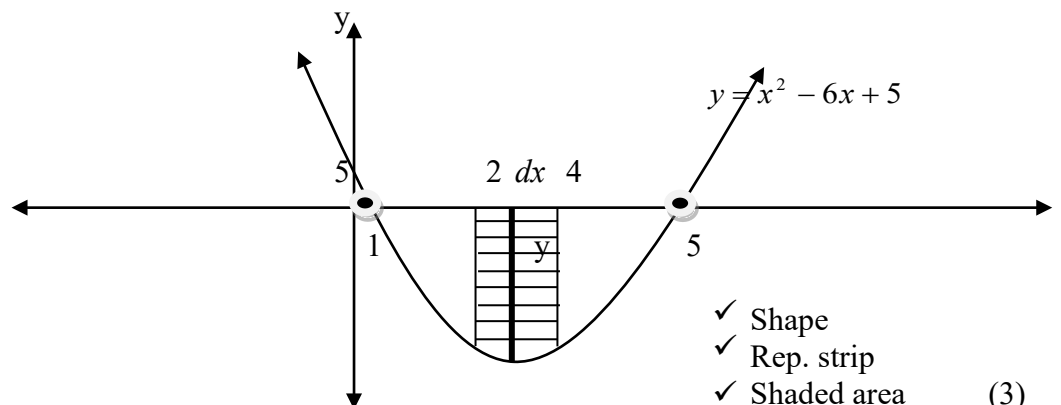
$$\square (0,214; 8,209) \text{ minimum } \quad \checkmark$$

$$\text{At } x = 3,12 : \frac{d^2y}{dx^2} = 6(3,12) + 10 = 18,72 < 0 \text{ M}$$

$$\square (3,12; 4,061) \text{ maximum } \quad \checkmark$$

(9)

1.2 1.2.1



$$\begin{aligned}
 1.2.2 \quad Aox &= \int_2^4 (x^2 - 6x + 5) dx \quad \checkmark \\
 &= \left[\frac{x^3}{3} - 3x^2 + 5x \right]_2^4 \quad \checkmark \\
 &= \left[\frac{4^3}{3} - 3(4)^2 + 5(4) \right] - \left[\frac{2^3}{3} - 3(2)^2 + 5(2) \right] \quad \checkmark \\
 &= -6,667 - 0,667 \\
 &= -7,334u^2 \\
 &= 7,334u^2 \quad \checkmark
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 1.3 \quad W &= [50x^2]_{0,5}^1 \quad \checkmark \\
 &= 50(1)^2 - 50(0,5)^2 \quad \checkmark \\
 &= 37,5u \quad \checkmark
 \end{aligned} \tag{3}$$

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QUESTION 2

$$\begin{aligned}
 2.1 \quad &-\frac{2^{-9x}}{9 \ln 2} - \frac{1}{2} \cot x - \pi \ln x - \frac{5}{2\sqrt[3]{x^2}} - \sec 15x - \ln yx + c \\
 &\checkmark \quad \checkmark \quad \checkmark \quad \checkmark \quad \checkmark \quad \checkmark \quad \checkmark
 \end{aligned} \tag{7}$$

$$\begin{aligned}
 2.2 \quad &-2 \cot x + \operatorname{cosec} x + c \\
 &\checkmark \quad \checkmark \quad \checkmark
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 2.3 \quad &\sqrt{x} + \frac{h}{2\sqrt{x}} - \frac{h^2}{8\sqrt{x^3}} \\
 &\checkmark \quad \checkmark \quad \checkmark
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 2.4 \quad y &= \frac{\sin x}{\cos x} \\
 \text{Let } u &= \sin x \quad \text{and} \quad v = \cos x \\
 u^1 &= \cos x \quad \checkmark \\
 v^1 &= -\sin x \quad \checkmark \\
 \frac{dy}{dx} &= \frac{v \cdot u^1 - uv^1}{v^2} \\
 &= \frac{\cos x \cdot \cos x - \sin x(-\sin x)}{(\cos x)^2} \quad \checkmark \\
 &= \frac{\cos^2 x + \sin^2 x}{\cos^2 x} \\
 &= \frac{1}{\cos^2 x} \\
 &= \sec^2 x \quad \checkmark
 \end{aligned}
 \tag{4}$$

$$\begin{aligned}
 2.5 \quad &= 5 \cdot 3^{5x} \cdot \ln 3 - \sin x - \cos x + 0
 \end{aligned}
 \tag{4}$$

[21]

QUESTION 3

$$\begin{aligned}
 3.1 \quad b + 7 &= L \dots \dots \dots (1) \\
 A &= L \times b \\
 500 &= (b + 7)b \\
 b^2 + 7b - 500 &= 0 \dots \dots \dots (2) \quad \checkmark \\
 b &= \frac{-7 \pm \sqrt{2049}}{2} \\
 b_1 &= 19,133 \text{ m}; b_2 = -26,133 \text{ (ignore)} \\
 L &= 19,133 \text{ m} + 7 = 26,133 \text{ m} \quad \checkmark \\
 \text{New area} &= l \times b \\
 &= (19,133 \text{ m} + 3 \text{ m}) \times (26,133 \text{ m} + 3 \text{ m}) \quad \checkmark \\
 &= 644,801 \text{ m}^2 \quad \checkmark
 \end{aligned}
 \tag{5}$$

$$3.2 \quad e^{\frac{gv}{ct}} = \frac{j}{I} - 1$$

$$\ln\left(e^{\frac{gv}{ct}}\right) = \ln\left(\frac{j}{I} - 1\right) \quad \checkmark$$

$$\frac{gv}{ct} = \ln\left(\frac{j}{I} - 1\right) \quad \checkmark$$

$$g = \frac{ct \ln\left(\frac{j}{I} - 1\right)}{v} \quad \checkmark \quad (3)$$

$$3.3 \quad (2x + 2)\ln 5 = (x - 1)\ln 4$$

$$3,21887x + 3,21887 = 1,38629x - 1,38629 \quad \checkmark$$

$$1,83258x = -4,60516$$

$$x = -2,513 \quad \checkmark$$

OR

$$(2x + 2)\log 5 = \log 4(x - 1)$$

$$0,6989(2x + 2) = 0,609(x - 1)$$

$$1,398x + 1,398 = 0,602x - 0,602$$

$$1,398x - 0,602x = -1,398 - 0,602$$

$$0,796x = -2$$

$$= x = -2,513 \quad (2)$$

$$3.4 \quad Z_T = \frac{3 + j4}{(5 - j4) + (2 + j3)}$$

$$= \frac{3 + j4}{7 - j} \times \frac{7 + j}{7 + j} \quad \checkmark$$

$$= \frac{21 + j28 + j3 + j^2 4}{49 - j2} \quad \checkmark$$

$$Z_T = \frac{17}{50} + \frac{j31}{50}$$

$$= 0,34 + j0,62 \quad \checkmark$$

$$\gamma = \sqrt{(0,34)^2 + (0,64)^2}$$

$$= \frac{V2}{2} = 0,707$$

$$\theta = \tan^{-1} \frac{0,62}{0,34} = 68,067^\circ \quad \checkmark$$

$$Z_T = \frac{\sqrt{2}}{2} |68,067^\circ \quad \checkmark \quad (5)$$

$$3.5 \quad t = \frac{2 \pm \sqrt{-12}}{2} \quad \checkmark$$

$$t = \frac{2 \pm \sqrt{-1}\sqrt{12}}{2} \quad \checkmark$$

$$t = \frac{2 \pm j\sqrt{12}}{2} \quad \checkmark$$

$$t = 1 - \frac{j\sqrt{12}}{2} \text{ or / of } t = 1 + \frac{j\sqrt{12}}{2} \quad \checkmark \quad (4)$$

$$3.6 \quad -j3 \quad \checkmark \quad (1)$$

[20]

QUESTION 4

$$4.1 \quad |D| = \begin{vmatrix} 3 & -5 & 3 \\ 2 & 1 & -7 \\ -10 & 4 & 5 \end{vmatrix} \quad \checkmark$$

$$|D| = 3 \begin{vmatrix} 1 & -7 \\ 4 & 5 \end{vmatrix} + 5 \begin{vmatrix} 2 & -7 \\ -10 & 5 \end{vmatrix} + 3 \begin{vmatrix} 2 & 1 \\ -10 & 4 \end{vmatrix} \quad \checkmark$$

$$= 3(33) + 5(-60) + 3(18)$$

$$= -147 \quad \checkmark$$

$$|DI_3| = \begin{vmatrix} 3 & -5 & 7,5 \\ 2 & 1 & -17,5 \\ -10 & 4 & 16 \end{vmatrix} \quad \checkmark$$

$$= 3 \begin{vmatrix} 1 & -17,5 \\ 4 & 16 \end{vmatrix} + 5 \begin{vmatrix} 2 & -17,5 \\ -10 & 16 \end{vmatrix} + 7,5 \begin{vmatrix} 2 & 1 \\ -10 & 4 \end{vmatrix} \quad \checkmark$$

$$= 3(86) + 5(-143) + 7,5(18)$$

$$= -322 \quad \checkmark$$

$$I_3 = \frac{|DI_3|}{|D|} = \frac{-322}{-147} \quad \checkmark$$

$$I_3 = 2,19 \quad \checkmark \quad (8)$$

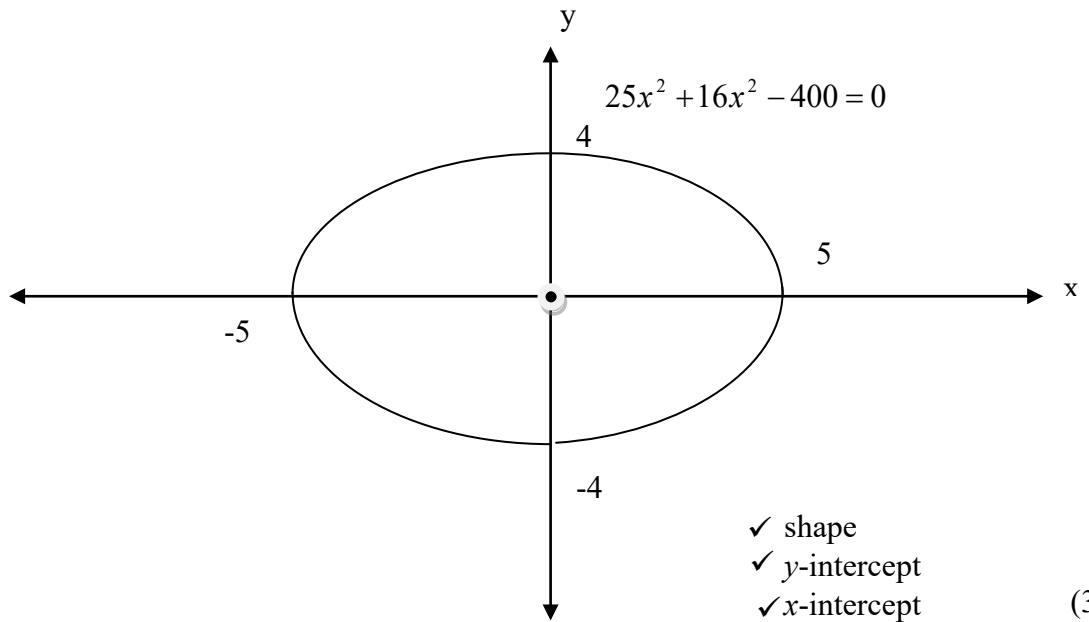
$$4.2 \quad 4.2.1 \quad \begin{pmatrix} - \end{pmatrix} \begin{vmatrix} 1 & 5 \\ -2 & 7 \end{vmatrix} \quad \checkmark$$

$$= -17 \quad \checkmark$$

4.2.2 $\begin{vmatrix} -2 & 3 \\ 6 & -1 \end{vmatrix} \checkmark$
 $= -16 \quad \checkmark$

(2 × 2) (4)

4.3 4.3.1

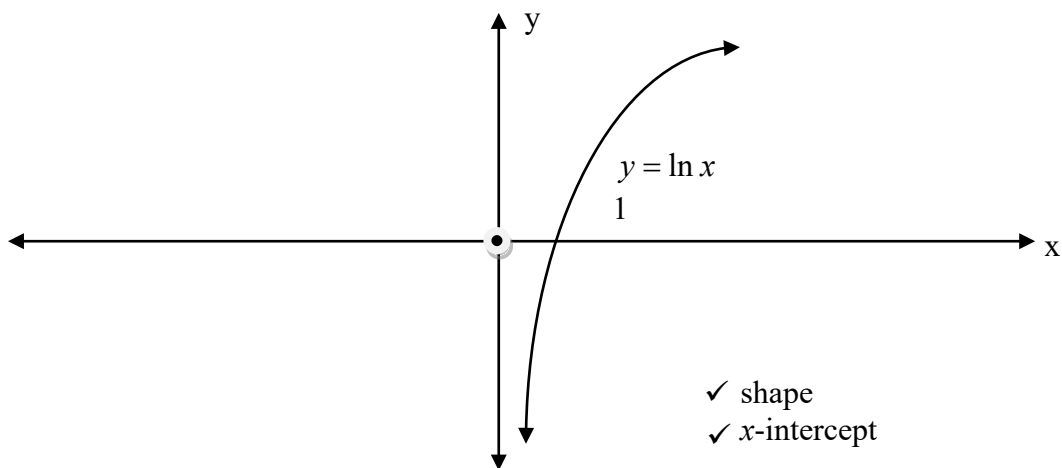


(3)

4.3.2 x or y-axis \checkmark

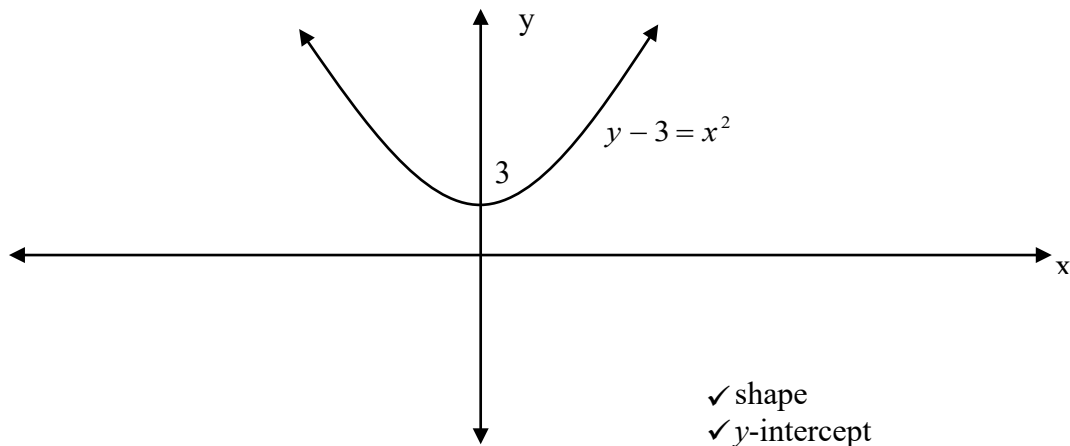
(1)

4.4



(2)

4.5



✓ shape
✓ y-intercept

(2)
[20]

QUESTION 5

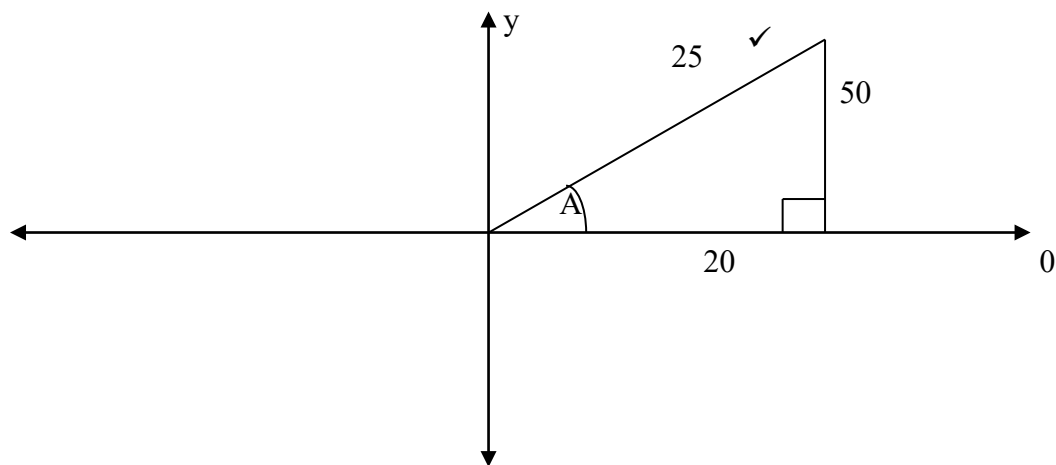
5.1 $\operatorname{cosec}(2\theta - 70^\circ) = \operatorname{cosec}\left[90^\circ - \left(\frac{\theta}{2} + 10^\circ\right)\right]$ ✓OR $\operatorname{cosec}[90^\circ - (20 - 70^\circ)] = \sec\left(\frac{0}{2} + 10^\circ\right)$
 $\operatorname{cosec}(2\theta - 70^\circ) = \operatorname{cosec}\left(80^\circ - \frac{\theta}{2}\right)$ ✓ $\sec/c(90^\circ - 70^\circ) = \sec/c\left(\frac{0}{2} + 10^\circ\right)$
 $2\theta - 75^\circ = 80^\circ - \frac{\theta}{2}$ $160^\circ - 10^\circ = \frac{50}{2}$
 $\theta = 60^\circ$ ✓ $300^\circ = 50$
 $\therefore \sigma = 60^\circ$ (3)

5.2 $RHS = \frac{1 - \tan^2 x}{\sqrt{(1 + \tan^2 x)}}$ ✓
 $= \frac{1 - \tan^2 x}{1 + \tan^2 x}$
 $= \frac{1 - \tan^2 x}{\sec^2 x}$
 $= \frac{1}{\sec^2 x} - \frac{\tan^2 x}{\sec^2 x}$ ✓
 $= \cos^2 x - \sin^2 x$ ✓
 $= \cos 2x$ ✓
 $LHS = RHS$ ✓ (6)

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

(4)

5.4



$$\begin{aligned}
 \cos \frac{A}{2} &= \frac{20}{25} \checkmark \\
 &= \frac{10}{25} \checkmark
 \end{aligned}$$

(4)

$$\begin{aligned}
 5.5 \quad & \frac{-\tan \theta \cdot -\cos \theta \cdot \left(\frac{1}{\sin \theta}\right)}{-\sin \theta \cdot \tan \theta \cdot -\cos \theta} \\
 &= \frac{-1}{\sin \theta} \cdot \frac{-1}{\sin \theta} \checkmark \\
 &= \frac{1}{\sin^2 \theta} \checkmark \\
 &= \operatorname{cosec}^2 \theta \checkmark
 \end{aligned}$$

(3)

[20]

TOTAL: 100