



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

MATHEMATICS N3

1 APRIL 2016

This marking guideline consists of 10 pages.

QUESTION 1

$$\begin{aligned}
 1.1 \quad 1.1.1 \quad & x(3x-2) - y(3y+2) \\
 & = 3x^2 - 2x - 3y^2 - 2y \quad \checkmark \\
 & = 3(x^2 - y^2) - 2(x+y) \quad \checkmark \\
 & = 3(x-y)(x+y) - 2(x+y) \\
 & = (x+y)[3(x-y) - 2] \\
 & = (x+y)[3x - 3y - 2] \quad \checkmark \quad \checkmark \quad (4)
 \end{aligned}$$

$$\begin{aligned}
 1.1.2 \quad & 4n^{4p} + 3n^{2p} - 1 \\
 & = (n^{2p} + 1)(4n^{2p} - 1) \quad \checkmark \quad \checkmark \quad (2)
 \end{aligned}$$

$$\begin{aligned}
 1.2 \quad & f(x) = 2x^3 + x^2 - 5x + 2 \\
 & \therefore f(1) = 2(1)^3 + (1)^2 - 5(1) + 2 \\
 & \quad = 2 + 1 - 5 + 2 \quad \checkmark \\
 & \quad = 0 \\
 & \therefore x-1 \text{ is a factor of } f(x) \quad \checkmark \\
 & \begin{array}{r}
 \overline{2x^2 + 3x - 2} \\
 x-1 \overline{) 2x^3 + x^2 - 5x + 2} \quad \checkmark \\
 \underline{2x^3 - 2x^2} \\
 3x^2 - 5x \\
 \underline{3x^2 - 3x} \\
 -2x + 2 \\
 \underline{-2x + 2} \\
 0
 \end{array} \\
 & \therefore f(x) = (x-1)(2x^2 + 3x - 2) \\
 & \quad = (x-1)(2x-1)(x+2) \quad \checkmark \quad \checkmark
 \end{aligned}$$

(5)

$$\begin{aligned}
 1.3 \quad & \frac{x-1}{x+1} - \frac{2x-1}{3-x} + \frac{2x^2-7x-17}{x^2-2x-3} \\
 &= \frac{x-1}{x+1} + \frac{2x-1}{x-3} + \frac{2x^2-7x-17}{(x+1)(x-3)} \checkmark \checkmark \\
 &= \frac{(x-1)(x-3) + (2x-1)(x+1) + 2x^2-7x-17}{(x+1)(x-3)} \checkmark \\
 &= \frac{x^2-4x+3+2x^2+x-1+2x^2-7x-17}{(x+1)(x-3)} \checkmark \\
 &= \frac{5x^2-10x-15}{(x+1)(x-3)} \\
 &= \frac{5(x^2-2x-3)}{(x+1)(x-3)} \checkmark \\
 &= \frac{5(x+1)(x-3)}{(x+1)(x-3)} \\
 &= 5 \checkmark
 \end{aligned}$$

(6)
[17]

QUESTION 2

2.1

$$\frac{\sqrt{x} - \frac{1}{2\sqrt{x}}}{3x^{\frac{3}{2}}}$$

$$= \frac{2x-1}{2x^{\frac{1}{2}}} \div 3x^{\frac{3}{2}} \quad \checkmark$$

$$= \frac{2x-1}{2x^{\frac{1}{2}}} \times \frac{1}{3x^{\frac{3}{2}}} \quad \checkmark$$

$$= \frac{2x-1}{6x^2} \quad \checkmark$$

(4)

2.2

$$\log_{0,5} 128$$

$$= \frac{\log_2 128}{\log_2 \frac{1}{2}} \quad \checkmark$$

$$= \frac{\log_2 2^7}{\log_2 2^{-1}} \quad \checkmark$$

$$= \frac{7 \log_2 2}{-1 \log_2 2} \quad \checkmark$$

$$= -7$$

(4)

2.3

2.3.1

$$\sqrt{16+3^{2x}} = 3^x + 2$$

$$\therefore 16+3^{2x} = (3^x + 2)^2 \quad \checkmark$$

$$\therefore 16+3^{2x} = 3^{2x} + 4 \cdot 3^x + 4 \quad \checkmark$$

$$\therefore 12 = 4 \cdot 3^x \quad \checkmark$$

$$\therefore 3^x = 3 \quad \checkmark$$

$$\therefore x = 1 \quad \checkmark$$

TEST : If $x = 1$ then LHS=RHS=5

(4)

2.3.2

$$(\log x - 2) \times \log(x - 2) = 0$$

$$\therefore \log x - 2 = 0 \quad \text{or} \quad \log(x - 2) = 0$$

$$\therefore \log x = 2 \quad \checkmark \quad x - 2 = 10^0 \quad \checkmark$$

$$\therefore x = 10^2 \quad x - 2 = 1$$

$$\therefore x = 100 \quad \checkmark \quad x = 3 \quad \checkmark$$

(4)

[16]

QUESTION 3

$$3.1 \quad 4x = 48 - 2x^2$$

$$2x^2 + 4x = 48 \checkmark$$

$$x^2 + 2x = 24$$

$$x^2 + 2x + 1 = 24 + 1 \checkmark$$

$$(x + 1)^2 = 25$$

$$x + 1 = \pm\sqrt{25} \checkmark$$

$$x = -1 \pm 5$$

$$x = -6 \quad \text{or} \quad x = 4 \checkmark$$

(4)

3.2

$$D = \sqrt{\frac{x+b}{x-b}}$$

$$D^2 = \frac{x+b}{x-b} \checkmark$$

$$D^2x - D^2b = x + b \checkmark$$

$$D^2b + b = D^2x - x$$

$$b(D^2 + 1) = D^2x - x \checkmark$$

$$b = \frac{D^2x - x}{D^2 + 1} = \frac{(D^2 - 1)x}{D^2 + 1} \checkmark$$

(4)

3.3 $\log_e t - \log_e p + \log_e w = ds$

$$\log_e \frac{tw}{p} = ds \checkmark$$

$$\frac{tw}{p} = e^{ds} \checkmark$$

$$w = \frac{p}{t} e^{ds} \checkmark$$

(3)

3.4 Deposit is R3x ✓

Total price is R33x

Total amount for 9 instalments= R30x ✓

$$\therefore \text{Each monthly instalment} = R \frac{30x}{9} = R \frac{10x}{3} \quad \checkmark \quad \checkmark$$

(4)

[15]

QUESTION 4

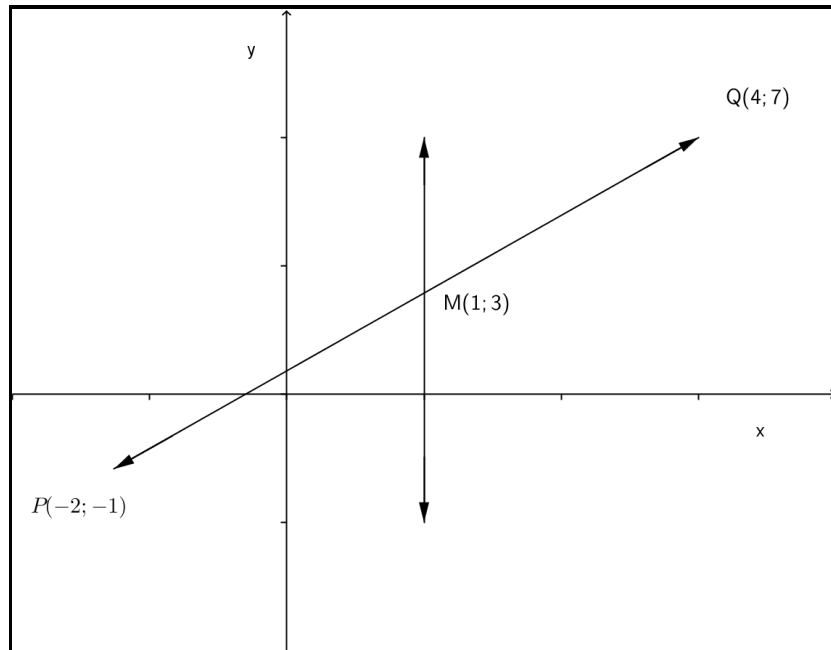
4.1 4.1.1 $AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
 $= \sqrt{(4 - 2)^2 + (5 - 1)^2}$
 $= \sqrt{4 + 16} \quad \checkmark$
 $= \sqrt{20}$
 $= 2\sqrt{5} \quad \checkmark$ (2)

4.1.2 $BC = 2\sqrt{5}$
 $\therefore \sqrt{(0 - 4)^2 + (k - 5)^2} = \sqrt{20}$
 $\therefore 16 + (k - 5)^2 = 20 \quad \checkmark$
 $\therefore (k - 5)^2 = 4$
 $\therefore k - 5 = \pm 2 \quad \checkmark$
 $\therefore k - 5 = 2 \quad \text{or} \quad k - 5 = -2$
 $\therefore k = 7 \quad \checkmark \quad k = 3 \quad \checkmark$ (4)

4.1.3 $\therefore M_{AB} = \frac{5 - 1}{4 - 2} = 2 \quad \checkmark$
 $\therefore M_{CB} = \frac{7 - 5}{0 - 4} = -\frac{1}{2} \quad \checkmark$
 $M_{AB} \times M_{CB} = -1 \quad \checkmark$
 therefore $CB \perp AB$ (3)

4.1.4 Area of $\triangle ABC = \frac{1}{2} \times \text{base} \times \text{height}$
 $= \frac{1}{2} AB \times BC \quad \checkmark$
 $= \frac{1}{2} \sqrt{20} \times \sqrt{20} \quad \checkmark$
 $= 10 \text{ units}^2 \quad \checkmark$ (3)

4.2



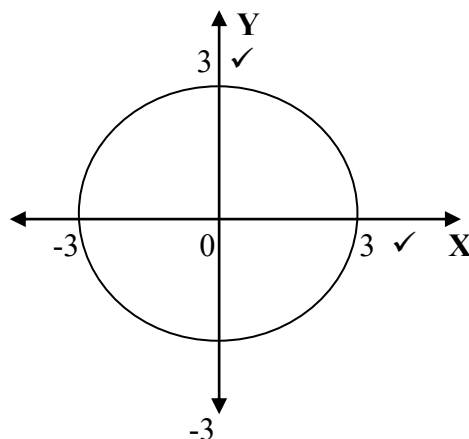
$$\begin{aligned}
 \text{coordinates of } M &= \left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2} \right) \\
 &= \left(\frac{-2 + 4}{2}; \frac{-1 + 7}{2} \right) \\
 &= (1; 3) \quad \checkmark \quad \checkmark \\
 \therefore \text{Equation } x &= 1 \quad \checkmark \quad \checkmark
 \end{aligned}$$

(4)

$$\begin{aligned}
 4.3 \quad M_{AB} &= 1 \quad \checkmark & M_{AC} &= 3 \quad \checkmark \\
 \therefore \tan \theta &= 1 & \therefore \tan \alpha &= 3 \\
 \therefore \theta &= 45^\circ \quad \checkmark & \therefore \alpha &= 71,565^\circ \quad \checkmark \\
 \hat{BAC} &= \alpha - \theta = 71,565^\circ - 45^\circ = 26,565^\circ \quad \checkmark
 \end{aligned}$$

(5)
[21]**QUESTION 5**

$$5.1 \quad 3x^2 + 3y^2 = 27$$



(2)

5.2.1 $y = x^3 + 6x^2 + 9x$
 $\frac{dy}{dx} = 3x^2 + 12x + 9$ ✓

Let $y = 0$

$\therefore +3x^2 + 12x + 9 = 0$

$3(x^2 + 4x + 3) = 0$

$(x+1)(x+3) = 0$ ✓ ✓

$x = -1$ or $x = -3$

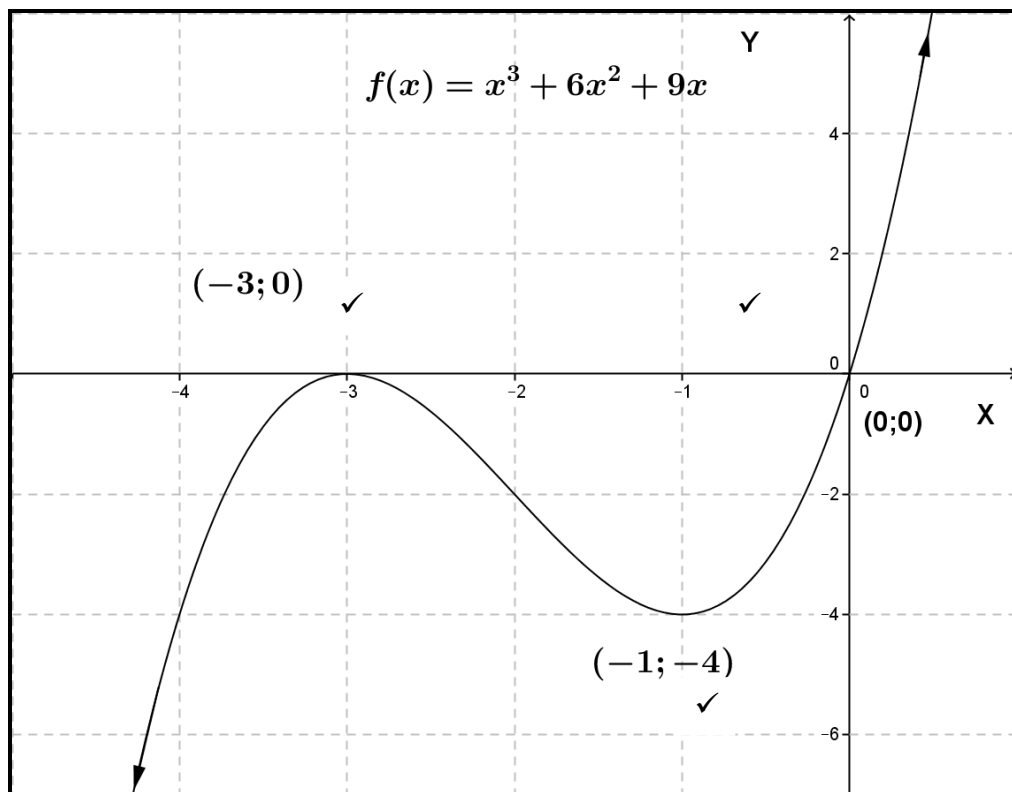
$f(-1) = -(-1)^3 - 6(-1)^2 - 9(-1) = 4$

$f(-3) = -(-3)^3 - 6(-3)^2 - 9(-3) = 0$ ✓ ✓

Turningpoints $(-3; 0)$ and $(-1; 4)$

(5)

5.2.2



(3)

5.3

$y = \frac{1}{x} + 2\sqrt{x}$ ✓

$y = x^{-1} + 2x^{\frac{1}{2}}$ ✓

$\frac{dy}{dx} = -x^{-2} + 2(0,5)x^{-\frac{1}{2}}$ ✓

$\frac{dy}{dx} = -\frac{1}{x^2} + \frac{1}{\sqrt{x}}$ ✓ ✓

(4)

[14]

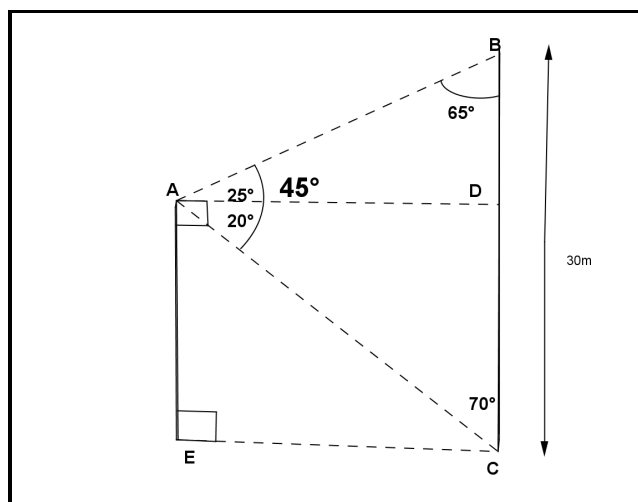
QUESTION 6

$$\begin{aligned}
 6.1 \quad LHS &= \sin^2 A + \tan^2 A + \cos^2 A \\
 &= (\sin^2 A + \cos^2 A) + \tan^2 A \checkmark \\
 &= 1 + \tan^2 A \checkmark \checkmark \\
 &= \sec^2 A = RHS \checkmark
 \end{aligned}
 \tag{4}$$

$$\begin{aligned}
 6.2 \quad \sin \theta &= 1 - \cos^2 \theta \\
 \therefore \sin \theta &= \sin^2 \theta \quad \checkmark \\
 \therefore \sin^2 \theta - \sin \theta &= 0 \\
 \therefore \sin \theta (\sin \theta - 1) &= 0 \quad \checkmark \\
 \therefore \sin \theta &= 0 \text{ or } \sin \theta = 1 \\
 \therefore \theta &= 0^\circ \quad \text{or} \quad \theta = 90^\circ \quad \checkmark \\
 \text{or } \theta &= 180^\circ \quad \checkmark \quad \checkmark
 \end{aligned}
 \tag{5}$$

$$\begin{aligned}
 6.3 \quad 6.3.1 \quad & \text{In } \triangle ABC : \\
 & \frac{AB}{\sin 70^\circ} = \frac{30}{\sin 45^\circ} \quad \checkmark \\
 \therefore AB &= \frac{30 \sin 70^\circ}{\sin 45^\circ} \quad \checkmark \\
 &= 39,868m \quad \checkmark
 \end{aligned}
 \tag{3}$$

$$\begin{aligned}
 6.3.2 \quad & \text{In } \triangle ABD : \\
 & \frac{AD}{AB} = \cos 25^\circ \quad \checkmark \\
 \therefore AD &= AB \cos 25^\circ \quad \checkmark \\
 &= 39,868 \times \cos 25^\circ \\
 &= 36,133m \quad \checkmark
 \end{aligned}
 \tag{3}$$



6.4 $a = 2$ ✓
 $p = 2$ ✓

(2)
[17]

TOTAL: 100