higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MATHEMATICS N2

26 JULY 2019

This marking guideline consists of 10 pages.

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QUESTION 1

1.1 1.1.1

$$\frac{\sqrt{9x^{36}} \times \left(-3x^2\right)^3}{\left(3x^3\right)^6 \times \sqrt[3]{-27x^{27}}}$$

$$= \frac{3^{\frac{2}{2}} x^{\frac{36}{2}} \times -3^3 x^6}{3^6 x^{18} \times -3^{\frac{3}{3}} x^{\frac{27}{3}}}$$

$$= \frac{3^1 x^{18} \times -3^3 x^6}{3^6 x^{18} \times -3^1 x^9} \checkmark$$

$$= 3^{1+3-6-1} x^{18+6-18-9} \checkmark$$

$$= 3^{-3} x^{-3} \checkmark \quad (3)$$

1.1.2

$$\log_4 64 + \log_3 \frac{1}{81} + \log_2 \frac{1}{8}$$

$$= \log_4 4^3 + \log_3 3^{-4} + \log_2 2^{-3} \checkmark$$

$$= 3\log_4 4 - 4\log_3 3 - 3\log_2 2$$

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

$$= -4 \checkmark \quad (3)$$

1.1.3

$$\log_3 (\log_2 8)^{-1}$$

$$\checkmark \qquad \checkmark$$

$$= -\log_3 \left(\log_2 2^3\right)$$

$$= -\log_3 (3) \checkmark$$

$$= -1 \checkmark \quad (4)$$

1.2

$$A = \frac{1{,}15^2 \times \sqrt{5{,}4}}{6{,}21}$$

$$\ln A = \ln\left(\frac{1{,}15^2 \times \sqrt{5{,}4}}{6{,}21}\right) \qquad \checkmark \text{ Introducing ln on BOTH sides}$$

$$\ln A = \ln 1{,}15^2 + \ln 5{,}4^{\frac{1}{2}} - \ln 6{,}21 \checkmark$$

$$\ln A = 2\ln 1{,}15 + \frac{1}{2}\ln 5{,}4 - \ln 6{,}21$$

$$\ln A = 0{,}2795 + 0{,}8432 - 1{,}8262$$

$$\ln A = -0{,}7035 \checkmark$$

$$A = e^{-0{,}7035}$$

$$A = 0{,}495 \checkmark \quad (4)$$

1.3 $8^x = \frac{1}{4}.\sqrt{2}$

$2^{3x} = 2^{-2}.2^{-\frac{1}{2}}$ ✓

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

$3x = -\frac{3}{2}$ ✓

$x = -\frac{1}{2}$ ✓ (3)

1.4 1.4.1 $Z = \sqrt{R^2 + w^2L^2}$

$Z^2 = R^2 + w^2L^2$ ✓

$Z^2 - R^2 = w^2L^2$ ✓

$L^2 = \frac{Z^2 - R^2}{w^2}$ ✓

$L = \sqrt{\frac{Z^2 - R^2}{w^2}}$ ✓ (4)

1.4.2 $L = \sqrt{\frac{Z^2 - R^2}{w^2}}$

$L = \sqrt{\frac{(90)^2 - (12)^2}{(120)^2}}$ ✓

$L = 0,743$ ✓ (2)

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QUESTION 2

2.1 2.1.1

$18x^2 + 3x - 6$
$= 3(6x^2 + x - 2)$ ✓ common factor
$= 3(3x + 2)(2x - 1)$ ✓ quadratic trinomial (2)

2.1.2

$54x^2 - 6y^2$
$= 6(9x^2 - y^2)$ ✓common factor
$= 6(3x - y)(3x + y)$ ✓ difference between squares (2)

2.1.3

$4x^2 + 20x - 3xy - 15y$
$= 4x(x + 5) - 3y(x + 5)$ ✓
✓ ✓
$= (x + 5)(4x - 3y)$ (3)

2.2

$3x^2 - x - 14 = (3x - 7)(x + 2)$ ✓
$3x^2 - 13x + 14 = (3x - 7)(x - 2)$ ✓
$x^2 - 4 = (x + 2)(x - 2)$ ✓

✓ ✓ ✓
$LCM = (3x - 7)(x + 2)(x - 2)$
$HCF = 1$ ✓ (7)

2.3 2.3.1

$$3x + \frac{1}{x-2}$$
$$= \frac{3x(x-2)+1}{x-2} \checkmark$$
$$= \frac{3x^2 - 6x + 1}{x-2} \checkmark$$ (2)

2.3.2

$$\frac{x^2-9}{3y^2+y} \times \frac{3y^2-2y-1}{x^2+x-6}$$
$$\checkmark = \frac{(x-3)(x+3)}{y(3y+1)} \times \frac{(3y+1)(y-1)}{(x+3)(x-2)} \checkmark$$
$$= \frac{(x-3)(y-1)}{y(x-2)} \checkmark$$ (3)

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QUESTION 3

3.1 $x-6y=-32$ $x+5y=12$

$$\begin{array}{r} x-6y=-32 \\ -(x+5y=12) \\ \hline -11y=-44 \end{array} \checkmark$$

$y=4$ ✓

$x-6y=-32$

$x-6(4)=-32$ ✓

$x=-8$ ✓

OR

$x+5y=12$

$x=12-5y$

$x-6y=-32$ ✓

$(12-5y)-6y=-32$

$11y=-44$

$y=4$ ✓

$x=12-5y$

$x=12-5(4)$ ✓

$x=-8$ ✓

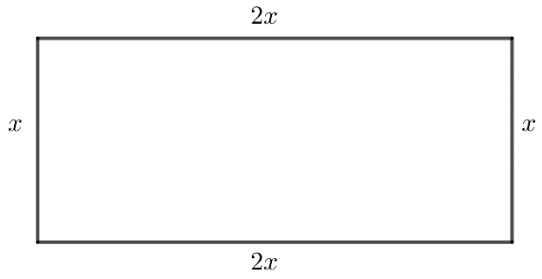
(4)

3.2 Perimeter $=2x+x+2x+x$ ✓

$120=2x+x+2x+x$

$120=6x$

$x=20\text{ cm}$ ✓



$A=l\times b$

$A=2x\times x$

$A=2(20)\times(20)$ ✓

$A=800\text{ cm}^2$ ✓

(4)

3.3 $\omega=2\pi n$

$\omega=2\pi(2{,}5)$ ✓

$\omega=15{,}708\text{ rad/s}$ ✓

$n=\dfrac{150}{60}$

$n=2{,}5\text{ revs/s}$ ✓

(3)

3.4 3.4.1

$\theta=\dfrac{\text{arc}}{\text{radius}}$

$\theta=\dfrac{5}{2}\text{ rad}$ ✓

$\theta=\dfrac{5}{2}\times\dfrac{180}{\pi}$ ✓

$\theta=143{,}239°$ ✓

(3)

3.4.2

$A=\dfrac{1}{2}r^2\theta$

$A=\dfrac{1}{2}(2)^2(2{,}5)$ ✓

$A=5\text{ m}^2$ ✓

(2)

3.5 3.5.1

$V_{cone} = V_{sphere}$

$V_{cone} = \frac{1}{3}\pi r^2 h$

$V_{cone} = \frac{1}{3}\pi\left(\frac{210}{2}\right)^2(110)$

$V_{cone} = 1269988{,}83 \text{ mm}^3$✓

$\therefore V_{sphere} = 1269988{,}83$

$\frac{4}{3}\pi r^3 = 1269988{,}83$ ✓

$r = \sqrt[3]{1269988{,}83 \times \frac{3}{4\pi}}$

$r = 67{,}180 \text{ mm}$✓

$D = 134{,}360 \text{ mm}$✓

OR

$V_{cone} = V_{sphere}$

$\frac{1}{3}\pi r_c{}^2 h = \frac{4}{3}\pi r_s{}^3$ ✓

$\frac{1}{3}\pi\left(\frac{210}{2}\right)^2(110) = \frac{4}{3}\pi r_s{}^3$

$\frac{1}{4}(105)^2(110) = r_s{}^3$ ✓

$r_s = \sqrt[3]{\frac{1}{4}(105)^2(110)}$

$r = 67{,}180 \text{ mm}$✓

$D = 134{,}360 \text{ mm}$✓

(4)

3.5.2 Surface Area $= 4\pi r^2$

Surface Area $= 4\pi(67{,}180)^2$ ✓

Surface Area $= 56713{,}946 \text{ mm}^2$✓

(2)

3.6 Volume $= \pi r^2 h$

$1178 = \pi r^2(15)$✓

$\frac{1178}{\pi(15)} = \frac{\pi r^2(15)}{\pi(15)}$

$r = \sqrt{\frac{1178}{\pi(15)}}$

$r = 4{,}9997$ ✓

$D = 9{,}999$ also accept $D = 10$ ✓

(3)

[25]

QUESTION 4

4.1
$$\text{Area} = \left[\frac{(\text{First ordinate} + \text{Last ordinate})}{2} + \text{Sum of all other ordinates}\right] \times \text{distance}$$
✓ ✓

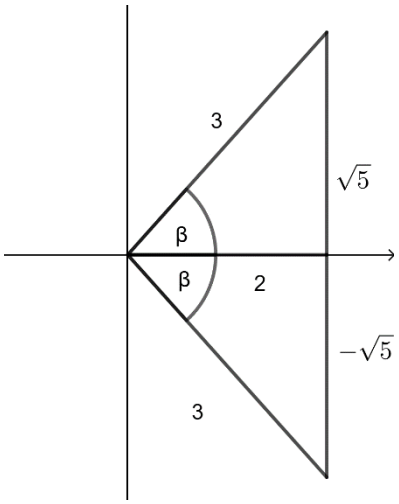
$$89{,}4 = d\left[\frac{3+3{,}6}{2} + 3{,}5 + 3{,}8 + 4{,}5 + 4{,}9 + 5{,}6 + 4{,}2\right]$$

$$\frac{89{,}4}{29{,}8} = d$$

$d = 3$ m✓ (3)

4.2 4.2.1
$$\cos\beta = \frac{2}{3} \qquad y^2 = r^2 - x^2$$

$$y = \sqrt{5}\ ✓$$



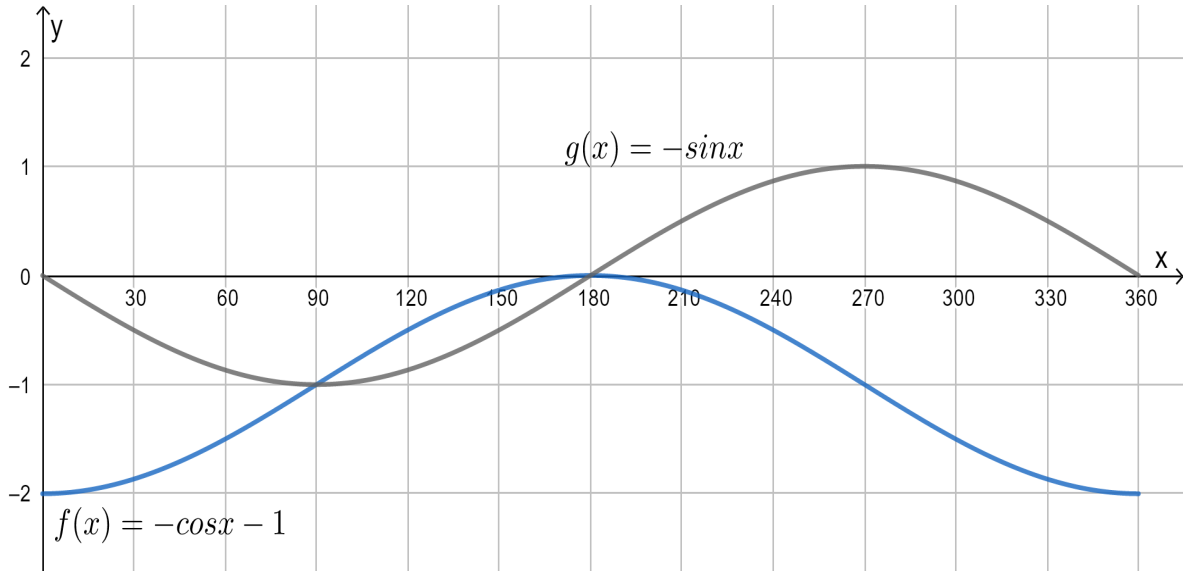
$$1 + \tan^2\beta$$
$$= 1 + \left(\frac{\sqrt{5}}{2}\right)^2 ✓$$
$$= 1 + \frac{5}{4}$$
$$= \frac{9}{4} ✓$$

(3)

4.2.2
$$\text{cosec}\beta.\sin\beta + 2$$
$$= \left(\frac{3}{\sqrt{5}}\right)\left(\frac{\sqrt{5}}{3}\right) + 2 ✓$$
$$= 1 + 2$$
$$= 3 ✓$$

(2)

4.3



(6)

Cosine graph: ✓1 mark start point, ✓1 mark end point, ✓1 mark correct shape passing through correct turning points

Sine graph: ✓1 mark start point, ✓1 mark end point, ✓1 mark correct shape passing through correct turning point

4.3.1 $x = 90°$ ✓and $x = 180°$ ✓ (2)

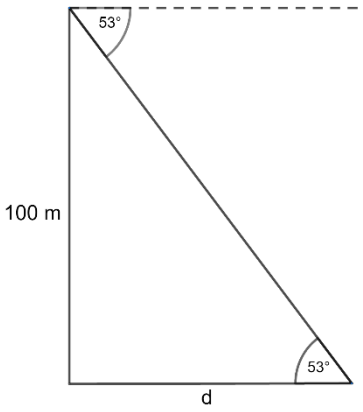
4.3.2 $x = 180°$ ✓ (1)

4.4

$$\tan 53° = \frac{100}{d} \checkmark$$

$$d = \frac{100}{\tan 53°} \checkmark$$

$$d = 75{,}355 \text{ m} \checkmark$$



(3)

[20]

QUESTION 5

5.1 5.1.1

$$x = \frac{-b}{2a}$$
$$x = \frac{-(-6)}{2(1)}$$
$$x = 3 \checkmark$$ (1)

5.1.2

$$x^2 - 6x + 9 = 0$$
$$(x-3)(x-3) = 0$$
$$x = 3 \checkmark$$ (1)

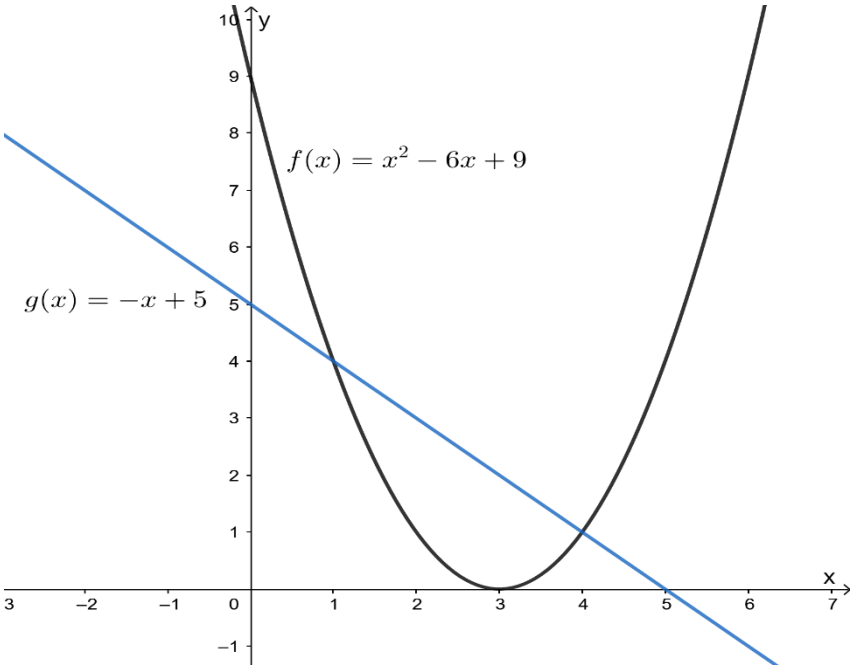
5.1.3

$$f(x) = x^2 - 6x + 9$$
$$f(3) = (3)^2 - 6(3) + 9$$
$$f(3) = 0 \checkmark$$
TP $(3;0) \checkmark$ (2)

5.1.4

$$f(x) = x^2 - 6x + 9$$
$$f(0) = 9 \checkmark$$ (1)

5.2



1 Mark for the y-intercept of straight line✓
1 Mark for the x-intercept of straight line✓
1 Mark for the shape of straight line regardless of intercepts✓
1 Mark for the shape of the parabola (even if intercepts are incorrect) ✓
1 Mark for the turning point of the parabola✓
1 Marks for the y intercept of the parabola✓ (6)

5.3 $x = 1$✓ and $x = 4$ ✓ (2)

[13]

TOTAL: 100

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