higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MATHEMATICS N3

8 April 2021

This marking guideline consists of 9 pages.

Copyright reserved

QUESTION 1

1.1
$$2(p-1)^2+7(p-1)-15$$
$$=[2(p-1)-3][(p-1)+5] \quad ✓✓$$
$$=(2p-2-3)(p-1+5) \quad ✓$$
$$=(2p-5)(p+4) \quad ✓$$
(4)

1.2 1.2.1
$$\frac{2ab}{a^2-b^2}+\frac{a}{b-a}+\frac{a}{a+b}+1$$
$$=\frac{2ab}{(a-b)(a+b)} \quad ✓ -\frac{a}{(a-b)} \quad ✓ +\frac{a}{a+b}+1$$
$$=\frac{2ab-a(a+b)+a(a-b)+(a-b)(a+b)}{(a-b)(a+b)} \quad ✓$$
$$=\frac{2ab-a^2-ab+a^2-ab+(a-b)(a+b)}{(a-b)(a+b)} \quad ✓$$
$$=\frac{(a-b)(a+b)}{(a-b)(a+b)} \quad ✓$$
$$=1 \quad ✓$$
(6)

1.2.2
$$\frac{4^{\frac{x}{2}}+4^{\frac{x}{2}-1}}{2^{x+2}+2^x}$$
$$=\frac{2^{2(\frac{x}{2})}+2^{2(\frac{x}{2})} \bullet 2^{-2}}{2^x \bullet 2^2+2^x} \quad ✓✓$$
$$=\frac{2^x(1+\frac{1}{4})}{2^x(4+1)} \quad ✓$$
$$=\frac{5}{4}\times\frac{1}{5} \quad ✓$$
$$=\frac{1}{4} \quad ✓$$
(5)

1.3 Let $x=2$
$$\therefore 2m(2)^3+(2)^2-2+2=5 \quad ✓$$
$$16m+4=5 \quad ✓$$
$$16m=1$$
$$m=\frac{1}{16} \quad ✓$$
(3)
[18]

QUESTION 2

2.1
$$\frac{B^{n+1}+B^n}{B^{3n}-9B^n}(B^n-3)$$
$$=\frac{B^n(B+1)}{B^n(B^{2n}-9)}\times(B^n-3) \quad \checkmark$$
$$=\frac{B+1}{(B^n-3)(B^n+3)}\times(B^n-3) \quad \checkmark$$
$$=\frac{B+1}{B^n+3} \quad \checkmark$$
(4)

2.2 2.2.1
$$\frac{4^{\frac{1}{2}x}\bullet 8^{-x+1}}{16^{x+2}}=4$$
$$4^{\frac{x}{2}}\bullet 8^{-x+1}=4\bullet 16^{x+2} \quad \checkmark$$
$$2^{\frac{2x}{2}}\bullet 2^{-3x+3}=2^2\bullet 2^{4x+8} \quad \checkmark$$
$$2^{-2x+3}=2^{4x+10}$$
$$-2x+3=4x+10 \quad \checkmark$$
$$-6x=10-3$$
$$x=-\frac{7}{6} \quad \checkmark$$
(4)

2.2.2
$$2\log_x 4-\log_x\frac{1}{2}=3-\log_x 54$$
$$\log_x 4^2-\log_x\frac{1}{2}=3-\log_x 54$$
$$\log_x\frac{16}{\frac{1}{2}}=3-\log_x 54 \quad \checkmark$$
$$\log_x 32+\log_x 54=3 \quad \checkmark$$
$$\log_x 32\times 54=3$$
$$x^3=1728 \quad \checkmark\checkmark$$
$$x=\sqrt[3]{1728}$$
$$x=12 \quad \checkmark$$
(4)
[12]

QUESTION 3

3.1

$$F = \frac{9c}{5} + 32$$

$$F - 32 = \frac{9}{5}c \checkmark$$

$$5F - 160 = 9c \quad \checkmark$$

$$c = \frac{5F - 160}{9} \checkmark$$

OR

$$c = \frac{5(F - 32)}{9} \checkmark$$

(3)

3.2

$$b = bxB^{-ya}$$

$$\frac{b}{bx} = B^{-ya} \quad \checkmark$$

$$\ln\frac{b}{bx} = \ln B^{-ya} \quad \checkmark$$

$$\ln\frac{b}{bx} = -ya\ln B \quad \checkmark$$

$$y = \frac{\ln\frac{b}{bx}}{-a\ln B} \checkmark$$

OR

$$y = \frac{\ln b - \ln bx}{-a\ln B} \quad \checkmark$$

(4)

3.3

$$\therefore x + 5y = 35520 \text{.....(1)}$$

$$3x + 9y = 72000 \text{.....(2)}$$

$$\therefore from(1) \Rightarrow x = 35520 - 5y \text{.....(3)} \checkmark$$

$$Substitute(3) in (2)$$

$$3(35520 - 5y) + 9y = 72000 \quad \checkmark$$

$$106560 - 15y + 9y = 72000$$

$$-6y = 72000 - 106560$$

$$-6y = -34560$$

$$y = 5760$$

$$\therefore x + 5(5760) = 35520 \checkmark$$

$$x = 35520 - 28800$$

$$x = 6720$$

Technician = R6 760 per month✓
Artisan = R5 760 per month✓

(5)

3.4 $x^2 = -kx + y$

$x^2 + kx = y$

$x^2 + kx + (\frac{k}{2})^2 = y + (\frac{k}{2})^2$ ✓

$(x + \frac{k}{2})^2 = y + \frac{k^2}{4}$ ✓

$x + \frac{k}{2} = \pm\sqrt{y + \frac{k^2}{4}}$ ✓

$x = -\frac{k}{2} \pm \sqrt{y + \frac{k^2}{4}}$ ✓

(4)
[16]

QUESTION 4

4.1 $M_{OD} = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{-6-0}{4-0}$ ✓

$= \frac{-3}{2}$ ✓

(2)

4.2 $Midpo\text{int}\, E = (\frac{x_1 + x_2}{2}; \frac{y_2 + y_1}{2})$

$= (\frac{0+4}{2}; \frac{0-6}{2})$ ✓

$= (2; -3)$ ✓

(2)

4.3 $y - y_1 = m(x - x_1)$

$y + 6 = \frac{2}{3}(x - 4)$ ✓

$y + 6 = \frac{2}{3}x - \frac{8}{3}$ ✓

$y = \frac{2}{3}x - \frac{26}{3}$ ✓

(3)

4.4 $y = \frac{2}{3}x - \frac{26}{3}$

$\therefore \frac{2}{3}x - \frac{26}{3} = 0$ ✓

$\frac{2}{3}x = \frac{26}{3}$

$2x = 26$

$x = 13$ ✓

$\therefore B(0;13)$ ✓

(3)

4.5 $M_{AC} = \frac{2}{3}$

$\therefore \theta = \tan^{-1}\frac{2}{3}$ ✓

$\theta = 33,69^0$ ✓ (2)

4.6 $y - y_1 = m(x - x_1)$

$y + 3 = \frac{2}{3}(x - 2)$ ✓

$y + 3 = \frac{2}{3}x - \frac{4}{3}$ ✓

$y = \frac{2}{3}x - \frac{13}{3}$ ✓ (3)

4.7 $AD = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(4-0)^2 + (-6 + \frac{26}{3})^2}$ ✓

$= \sqrt{16 + \frac{64}{9}}$ ✓

$= \sqrt{23,1}$ ✓ (3)

[18]

QUESTION 5

5.1 5.1.1 $f(x) = 2x^2 + 8x - 10$

$\therefore x^2 + 4x - 5 = 0$ ✓

$(x-1)(x+5) = 0$

$x = 1$ ✓ OR $x = -5$ ✓ (3)

5.1.2 $x = -\frac{b}{2a} = -\frac{4}{2(1)} = -2$ ✓

$\therefore y = (-2)^2 + 4(-2) - 5$

$= -9$ ✓

$\therefore$ The coordinates of B are $B(-2;-9)$ ✓✓ (4)

5.2

✓

✓

(2)

5.3 $f(x) = 3x^2 - 6$

$$\lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h\to 0} \frac{3x^2 + 6xh + 3h^2 - 6 - 3x^2 + 6}{h} \checkmark$$

$$= \lim_{h\to 0} \frac{6xh + 3h^2}{h} \checkmark$$

$$= \lim_{h\to 0} \frac{h(6x + 3h)}{h} \checkmark$$

$$= \lim_{h\to 0} 6x + 3h$$

$$= 6x \checkmark$$

(4)

5.4 $f(x) = \sqrt{x}(x_4 - \frac{1}{3x^2})$

$$f(x) = x^{\frac{1}{2}}(x^4 - \frac{x^{-2}}{3})$$

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

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

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

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

(3)
[16]

QUESTION 6

6.1

$$\frac{\sqrt{1+2\cos B+\cos^2 B}}{\sin^4 B+\sin^2 B\cos^2 B}=\frac{1}{1-\cos B}$$

$$LHS=\frac{\sqrt{1+2\cos B+\cos^2 B}}{\sin^4 B+\sin^2 B\cos^2 B}$$

$$=\frac{\sqrt{(1+\cos B)(1+\cos B)}}{\sin^2 B(\sin^2 B+\cos^2 B)}\checkmark$$

$$=\frac{\sqrt{(1+\cos B)^2}}{\sin^2 B(1)}\checkmark$$

$$=\frac{1+\cos B}{1-\cos^2 B}\checkmark$$

$$=\frac{1+\cos B}{(1-\cos B)(1+\cos B)}\checkmark$$

$$=\frac{1}{1-\cos B}$$

$$=RHS\checkmark$$

(5)

6.2

$$4\cos\beta=2\sin\beta$$

$$\frac{4\cos\beta}{2\cos\beta}=\frac{2\sin\beta}{2\cos\beta}\checkmark$$

$$2=\frac{\sin\beta}{\cos\beta}$$

$$\tan\beta=2\checkmark$$

$$\beta=\tan^{-1}2$$

$$=63,435^0\checkmark$$

$$180^0+63,435^0=243,435^0\checkmark$$

(4)

6.3

$$\frac{\sin M}{KL}=\frac{\sin L}{KM}$$

$$\frac{\sin 70^0}{8,6}=\frac{\sin L}{7}$$

$$\sin L=\frac{7\sin 70^0}{8,6}\checkmark$$

$$\sin L=0,765\checkmark$$

$$L=\sin^{-1}0,765$$

$$=49,907^0\checkmark$$

$$\angle K=180^0-(49,907^0+70^0)$$

$$=60,093^0\checkmark$$

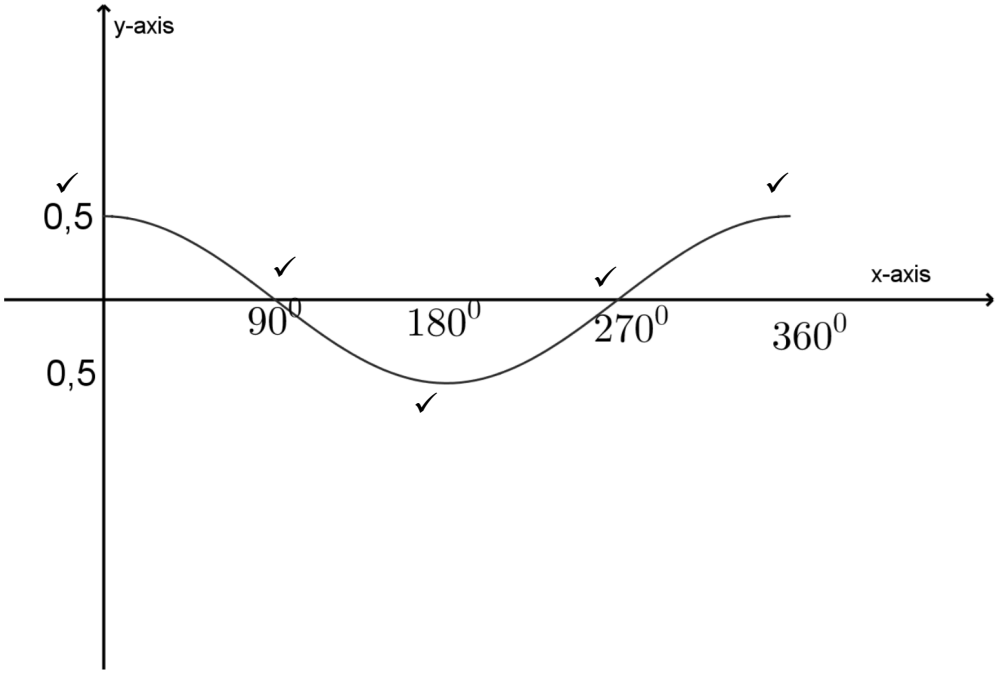
$$Area\Delta KLM=\frac{1}{2}KL.KM\sin\angle K$$

$$=\frac{1}{2}(8,6)(7)\sin 60,093^0\checkmark$$

$$=26,092m^2\checkmark$$

(6)

6.4



(5)
[20]

TOTAL: 100

Copyright reserved