higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

MATHEMATICS

(First paper)

NQF LEVEL 3

14 February 2025

This marking guideline consists of 9 pages.

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INSTRUCTIONS AND INFORMATION

1. This marking guideline consists of 10 pages.
2. Where a calculation or copying error takes place: penalize with one mark if the difficulty of the question remains intact. If the question is easier to solve, no marks are allocated.
3. When a second error in the same answer occurs, stop marking.
4. Where a principle (basic rule) error occurs, stop marking and do not allocate further marks.
5. Mathematically correct alternative answers may be marked.
6. Answers in pencil are not marked.
7. Where a question is attempted twice and neither of the answers cancelled, mark the first attempt only.
8. Be vigilant in the transfer of marks from the Addendum to the total of the question.
9. Some learners may do the graph twice – in the answer book and again on the Addendum. Be vigilant not to allocate marks twice.
10. ✓ one mark. √ half mark
11. Put your ticks and crosses neatly and legibly.

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QUESTION 1

1.1 1.1.1

$z_1 = (2-3i)^2$ ✓
$z_1 = 4 - 12i + 9i^2$
$z_1 = -5 - 12i$ ✓ (2)

1.1.2

$r = \sqrt{25+144} = 13$ ✓

$\theta = 180° + tan^{-1}\left(\frac{12}{5}\right) = 180° + 67{,}38°$ ✓67,38° ✓180° +
$\theta = 247{,}38°$

$z_1 = 13cis247{,}38°$ ✓polar form (4)

1.2

$3i^5 - (i)(2i)^3 + \sqrt{-9}.$ ✓✓✓one mark per term
$3(i^2)^2 i - (i)(8i^3) + 3i.$
$3i - 8i^4 + 3i$ ✓answers
$-8 + 6i$ (4)

[10]

QUESTION 2

2.1.1

$\frac{1}{5}(5-10i) - \frac{1-3i}{i-2}$ ✓$1-2i$
$= 1 - 2i - \left(\frac{1-3i}{-2+i} \cdot \frac{-2-i}{-2-i}\right)$ ✓conjugate

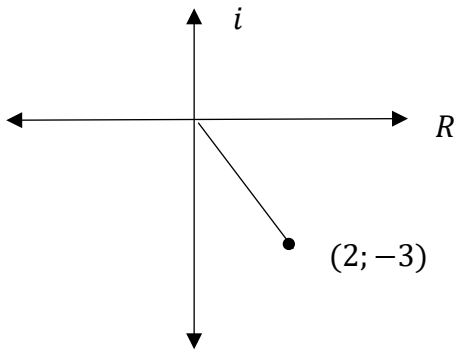
✓fraction

$= 1 - 2i - \left(\frac{-5+5i}{5}\right)$

✓answer

$= 1 - 2i + 1 - 1i$
$z = 2 - 3i$ (4)

2.1.2



✓$3rd\ quadrant$
*do not penalise for incorrect/ no labelling

(1)

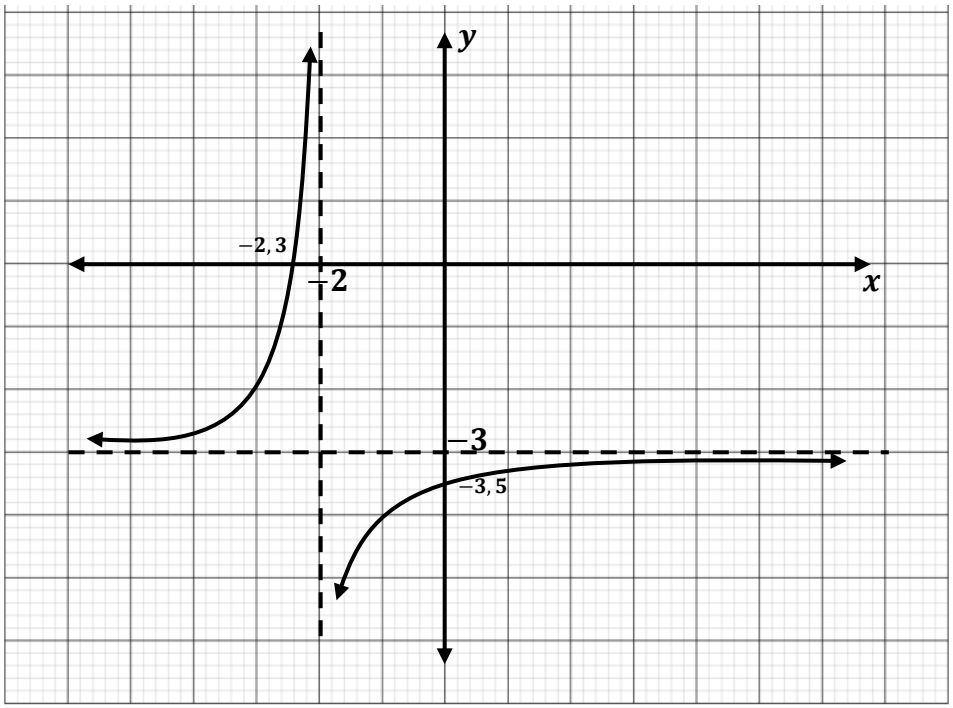
2.2	2.2.1	$(z_1)(z_2)$ $= (3cis25°)(2,9cis65°)$ $= 8,7cis90°$	✓substitution ✓modulus ✓argument	(3)
	2.2.2	$z_1 + z_2$ $(2,71892 + 1,26785i) + (1,22559 + 2,6282i)$ $= 3,945 + 3,896i$ *If rectangular form is not given separately, allocate 2 marks in answer for real & imaginary values Respectively	✓rectangular form ✓rectangular form ✓real value ✓imaginary value	(4)
2.3.1		$\bar{z} = -4,5 + 2i$	✓conjugate	(1)
2.3.2		$(z)(\bar{z})$ $= (-4,5 + 2i)(-4,5 - 2i)$ $= 20,25 + 9i - 9i - 4i^2$ $= 24,25 \quad or \quad 24,25 + 0i$	✓substitution ✓multiplication ✓✓answer	(4)

[17]

QUESTION 3

3.1	3.1.1	$-2x^2 + 8 = 0$ $x^2 - 4 = 0$ $(x + 2)(x - 2) = 0$ $x = -2 \ or \ x = 2$ $B(2\,;0) \quad and \ E\ (-2\,;0)$	✓ factors ✓both x-values ✓both coordinates	(3)
	3.1.2	$x\,\epsilon\,[-0.5\,;2] \quad or -0,5 \leq x \leq 2$	✓values ✓correct inequality signs/brackets	(2)
	3.1.3	$x \geq 0 \ \ or \ x\epsilon[0:\infty)$	✓	(1)
	3.1.4	$B(2\,;0)$ and $y = mx + 6$ $0 = m(2) + 6$ $m = -3$	✓ substitute $B(2\,;0)$ ✓$m = -3$	(2)
	3.1.5	$x\epsilon R \quad or \ \ x\epsilon(-\infty;\infty)$	✓	(1)

3.2



✓shape
✓asymptotes
✓x-intercept
✓y-intercept

(4)

3.3 3.3.1 $y = 2$ ✓✓ (2)

3.3.2 Continuous ✓ (1)

3.3.3 $K(0;3)$ ✓ (1)

3.3.4 $x > 0; x\epsilon R \quad or \quad x\epsilon(0;\infty)$ ✓✓ (2)

3.3.5 $y\epsilon R \quad or \quad y\epsilon(-\infty;\infty)$ ✓ (1)

[20]

QUESTION 4

4.1 $\dfrac{x^2 - y^2}{5x - 5y}$ ✓ $(x-y)(x+y)$
✓ $5(x-y)$

$= \dfrac{(x-y)(x+y)}{5(x-y)}$ ✓ $\frac{(x+y)}{5}$

$= \dfrac{(x+y)}{5}$ (3)

4.2.1 $x^2 - 3x - 4 = 0$ ✓ factors

$(x-4)(x+1) = 0$ ✓$x = 4$

$x = 4 \; or \; x = -1$ ✓$x = -1$ (3)

4.2.2 $2x^3 - 3x^2 = 5x$
$2x^3 - 3x^2 - 5x = 0$
$x(2x^2 - 3x - 5) = 0$
$x(2x - 5)(x + 1) = 0$
$x = 0 \ \ or \ \ x = -1 \ \ or \ \ x = \frac{5}{2}$

✓factors
✓✓✓ one mark per value (4)

4.2.3 $3(x + 11) = -5 + 2(x + 3)^2$

$3x + 33 = -5 + 2(x^2 + 6x + 9)$
$3x + 33 = -5 + 2x^2 + 12x + 18$

✓correct multiplication of brackets

✓standard form

$0 = 2x^2 + 9x - 20$

✓substitution

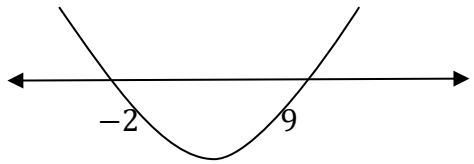
$x = \frac{-9 \pm \sqrt{9^2 - 4(2)(-20)}}{2(2)}$
$x = \frac{-9 \pm \sqrt{241}}{4}$

✓answer
✓answer
*Incorrect standard form – follow up with 1 mark for correct substitution

$x = 1{,}631 \ \ or \ \ x = -6{,}131$ (5)

4.2.4 Solve x if: $x(x - 7) \geq 18$
$x^2 - 7x_ - 18 \geq 0$
$(x - 9)(x + 2) \geq 0$

✓standard form
✓factors



$x \leq -2 \ \ or \ \ x \geq 9$ $or \ \ x\epsilon(-\infty; -2] \ \ or \ \ x\epsilon[9: \infty)$

✓ $x \leq -2$
✓ $x \geq 9$

*value and sign correct for each mark (4)

4.3 $y = x - 1$ and $y^2 = 2(x-1)$

$y = x - 1$
$(x-1)^2 = 2x - 2$ ✓standard form
$x^2 - 4x + 3 = 0$
$(x-3)(x-1) = 0$ ✓both x-values
$x = 3 \ \ or \ \ x = 1$ ✓both y-values
$y = 2 \qquad y = 0$

(4)

[23]

QUESTION 5

5.1

$h(x+h) = -\frac{1}{2} - 5x^2 - 10xh - 5h^2.$ ✓f(x+h)

$$= \lim_{h\to 0} \frac{-\frac{1}{2} - 5x^2 - 10xh - 5h^2 - (\frac{-1}{2} - 5x^2)}{h}$$

$$= \lim_{h\to 0} \frac{-10xh - 5h^2}{h}$$ ✓numerator

$$= \lim_{h\to 0} \frac{h(-10x - 5h)}{h}$$ ✓factorising

$h'(x) = -10x$ ✓answer (4)

5.2

$$\lim_{x\to -4} \frac{x^2 - 16}{x^3 + 16x}$$ ✓substitution

$$\lim_{x\to -4} \frac{(-4)^2 - 16}{(-4)^3 + 16(-4)}$$

$$\lim_{x\to -4} \frac{0}{-128}$$

$= 0$ ✓answer (2)

5.3 5.3.1

$$y = \frac{4}{3x} - 4\sqrt{x} + \frac{x}{4} - 4\pi$$

$$y = \frac{4}{3}x^{-1} - 4x^{\frac{1}{2}} + \frac{x}{4} - 4\pi$$

$$\frac{dy}{dx} = \frac{-4}{3}x^{-2} - 2x^{\frac{-1}{2}} + \frac{1}{4} + 0$$

$$\frac{dy}{dx} = \frac{-4}{3x^2} - \frac{2}{\sqrt{x}} + \frac{1}{4}$$

*If not changed to positive exponents
-maximum 2 marks

✓✓✓✓one mark per term with positive exponent

(4)

5.3.2 If $y = (x^6 - 1)^2$ show that $\frac{dy}{dx} = 12x^5\sqrt{y}$

$$y = x^{12} - 2x^6 + 1$$

$$\frac{dy}{dx} = 12x^{11} - 12x^5$$

$$\frac{dy}{dx} = 12x^5(x^6 - 1)$$

$$but\ x^6 - 1 = \sqrt{y}$$

$$\therefore \frac{dy}{dx} = 12x^5.\sqrt{y}$$

✓multiplication

✓✓derivatives

✓factorise

✓show $x^6 - 1 = \sqrt{y}$

only allocated if learner shows how to find $\sqrt{y}$

(5)
[15]

QUESTION 6

6.1 $A' = 0$
$320 - 2x = 0$
$320 = 2x$
$160 = x$

✓derivative
✓ $= 0$
✓answer

(3)

6.2 $Width$: $320 - 160$
$= 160\ cm$

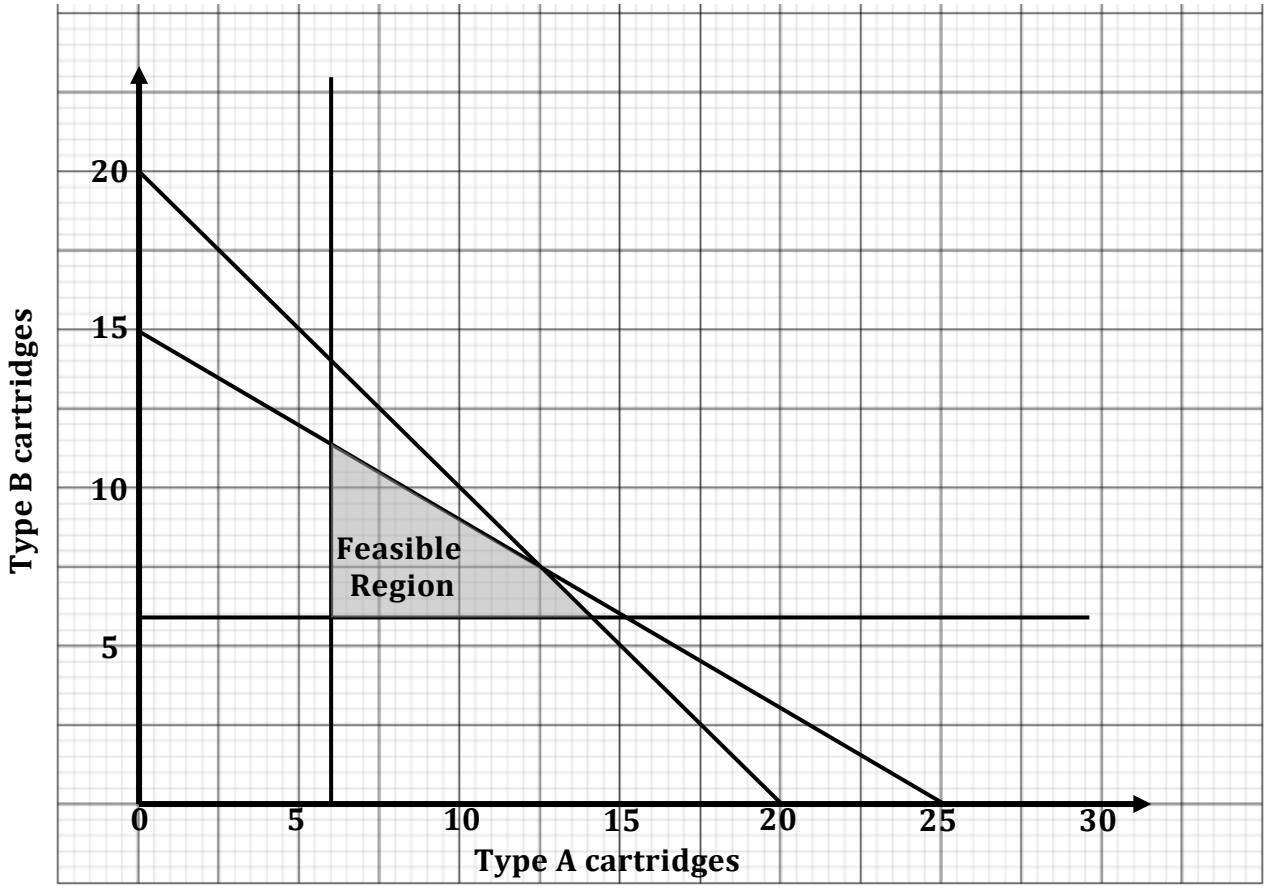
✓substitution
✓answer

*answer only with units – full marks
*deduct 1 mark if units omitted

(2)
[5]

QUESTION 7

7.1 ✓$x \geq 6$
✓$y \geq 6$
✓$x + y \leq 20$
✓$1\,800x + 3\,000y \leq 45\,000$
t
One mark for each correct line graph (both x-& y-intercepts correct).
At least 3 lines correct to continue to 7.2 and follow up. (4)



7.2 Shade and indicate the feasible region. ✓✓shade (2)

7.3 $P = 400x + 1000y$

✓method

$(6; 6)$: $P = R8\,400$
$(6; 11)$: $R13400$
$(12; 8)$: $P = R12\,800$
$(14; 6)$: $P = R11\,600$

Maximum profit: $R13\,400$. ✓profit
$Type\ A$: $6\ cartridges$ ✓value of type A
$Tyoe\ B$: $11\ cartridges$ ✓value of type B (4)
[10]

TOTAL 100

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