higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

NOVEMBER EXAMINATION

MATHEMATICS N2

17 NOVEMBER 2014

This marking guideline consists of 9 pages.

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INSTRUCTIONS AND INFORMATION

1. ✓ equals 1 mark.
2. Half marks are not allocated, unless indicated otherwise.
3. Using the wrong formula where a formula is required is a principle error and NO marks are allocated.
4. Students should show ALL formula, intermediate steps and simplify where possible.
5. ALL final answers must be rounded off to THREE decimal places (unless indicated otherwise).
6. Questions may be answered in any order, but subsections of questions must be kept together. If subsections are separated, the student can be penalised by ONE mark.
7. Where a student copied incorrectly from the question paper, and the standard of the question is still the same, the student will be penalised by ONE mark.
   If the copying error simplifies the question and makes it easier, the student forfeits the marks.
8. Questions must be answered in blue or black ink. Answers in PENCIL are not marked as it is regarded as rough work.

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QUESTION 1

1.1 1.1.1

$$\frac{1}{3}-3p^6$$

$$=\frac{1}{3}\left(1-9p^6\right) \quad ✓ \quad ✓$$

$$=\frac{1}{3}\left(1-3p^3\right)\left(1+3p^3\right) \quad ✓$$

✓common factor
✓✓difference of squares

(3)

1.1.2

$$x^3y+2x^2y-63xy$$

$$=xy\left(x-7\right)\left(x+9\right)$$

✓ ✓ ✓

✓common factor
✓✓factorisation

(3)

1.2

$$x^2-15x+36=(x-12)(x-3) \quad ✓$$

$$3x^2-27 \quad =3(x-3)(x+3) \quad ✓$$

$$5bx-15b \quad =5b(x-3) \quad ✓$$

✓ ✓

$$LCM=15b(x-3)(x+3)(x-12)$$

$$HCF=(x-3) \quad ✓ \quad ✓$$

✓✓✓ mark per expression

Penalise with a half mark for missing factor or unwanted factors. (7)

1.3 1.3.1

$$\frac{2x^2-32}{4xb+b}\times\frac{b}{x+4}\div\frac{8x-32}{4x+1}$$

$$=\frac{2(x-4)(x+4)}{b(4x+1)}\times\frac{b}{x+4}\times\frac{4x+1}{8(x-4)} \quad ✓ \quad ✓ \quad ✓$$

$$=\frac{1}{4} \quad ✓$$

✓division sign
✓✓ factorisation
✓simplification

(4)

1.3.2

$$\frac{3x}{x-3}-\frac{2x}{x^2-6x+9}$$

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

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

$$=\frac{3x^2-11x}{(x-3)^2} \quad ✓ \quad ✓ \quad ✓$$

✓factorisation
✓common denominator
✓✓ like fractions
✓simplification

(5)
[22]

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QUESTION 2

2.1

$$F=\frac{1}{a\sqrt{cx}}+v.....(x)$$

$$F-v=\frac{1}{a\sqrt{cx}} \quad \checkmark$$

$$(F-v)a=\frac{1}{\sqrt{cx}} \quad \checkmark$$

$$(F-v)^2a^2=\frac{1}{cx} \quad \checkmark$$

$$(F-v)^2a^2c=\frac{1}{x} \quad \checkmark$$

$$x=\frac{1}{(F-v)^2a^2c} \quad \checkmark$$

✓manipulation by subtracting v
✓cross multiplied
✓squaring
✓cross multiply
✓invert

(5)

2.2

$$(x+3)^2=25$$

$$x^2+6x+9=25 \quad \checkmark$$

$$x^2+6x-16=0$$

$$(x+8)(x-2)=0$$

$$\therefore x=-8 \quad or \quad x=2 \quad \checkmark \quad \checkmark$$

alternative solution

$$(x+3)^2=25 \quad \checkmark$$

$$x+3=\pm5 \quad \checkmark \quad \checkmark$$

$$\therefore x=-8 \quad or \quad x=2$$

✓multiplication
✓factorisation
✓answers

✓draw square roots
✓±
✓two solutions

(3)

2.3

$$3(x-2)-2(2x+1)=7-(3x+2)$$

$$3x-6-4x-2=7-3x-2 \quad \checkmark$$

$$2x=13 \quad \checkmark$$

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

✓removing brackets
✓simplify
✓solution

(3)

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2.4 let the one side, 6 m, be surrounded by the path of width x m.....$6+2x$ ✓✓✓✓ any innovative algebraic method ✓

and the other side, 4 m, surrounded by the path of width x m.....$4+2x$

$A_1 - A_2 = 56$

$(6+2x)(4+2x)-(6\times4)=56$ ✓

$24+20x+4x^2-24=56$

$-56+20x+4x^2=0$ ✓

$x^2+5x-14=0$ ✓

$(x-2)(x+7)=0$

$x=2$ or $x=-7$ ✓ ✓

width = 2 m (5)

2.5 $A = \text{distance}\left(\frac{\text{1st+last}}{2}+\text{sum of other ordinates}\right)$ ✓ ✓✓substitution ✓distance

$A=31\left(\frac{8+4}{2}+74\right)$ ✓

$A=31(80)$ ✓

$A=2\,480$ mm (3)

[19]

QUESTION 3

3.1 $\ln x=\frac{1}{3}\ln 5897-\ln 0{,}12-3\ln 3{,}5$ ✓ ✓✓expand ✓✓ values

$\ln x=2{,}894-(-2{,}12)-3{,}758$ ✓ ✓

$\ln x=1{,}256$ or $\ln x=1{,}253146$

$\therefore x=3{,}511$ ✓ (4)

3.2 $(\log_3 x)(\log_x 9)$

$=\frac{\log x}{\log 3}\times\frac{\log 9}{\log x}$ ✓ ✓change of bases ✓✓simplify

$=2$ ✓ ✓

(3)

3.3 $x=3^4$ ✓ ✓exponential form ✓answer (2)

$x=81$ ✓

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3.4
$$\frac{4^{x+1}.2^{2x+2}}{16^{x+1}} \quad \checkmark$$
$$=\frac{2^{2x+2}.2^{2x+2}}{2^{4x+4}} \quad \checkmark$$
$$=\frac{2^{4x+4}}{2^{4x+4}}$$
$$=1 \quad \checkmark$$

✓✓like bases
✓simplify

(3)

3.5 3.5.1
$$h^2=102^2-53^2 \quad \checkmark$$
$$h^2=7\,595$$
$$h=87{,}149 \quad \checkmark$$

✓using the correct formula
✓substituting and simplify

(2)

3.5.2
$$V=\frac{1}{3}\pi r^2 h$$
$$V=\frac{1}{3}\pi(53)^2(87{,}149) \quad \checkmark \quad \checkmark$$
$$V=256\,355{,}574\ \text{cm}^3 \quad \checkmark$$
$$V=256{,}356\ l \quad \checkmark$$

Follow up on the height calculated in QUESTION 3.5.1

✓using the correct formula
✓✓substituting and simplify
✓writing answer as liter

(4)
[18]

QUESTION 4

4.1 4.1.1
$$\theta=56\times\frac{\pi}{180}=0{,}977\text{rad} \quad \checkmark$$
$$\theta=\frac{s}{r} \quad \checkmark$$
$$0{,}977=\frac{s}{149} \quad \checkmark$$
$$s=145{,}630\ \text{mm} \quad \checkmark$$

Using degrees or the diameter – NO marks

✓use rad
✓use radius
✓substitution
✓simplify

(4)

4.1.2
$$A=\frac{1}{2}r^2\theta \quad \checkmark$$
$$A=0{,}5(149)^2(0{,}977) \quad \checkmark$$
$$A=10\,849{,}455\ \text{mm}^2 \quad \checkmark$$

✓formula
✓substitution using the correct formula
✓simplify

(3)

4.2 4.2.1
$$V=\pi Dn \quad \checkmark$$
$$2{,}3\times60=\pi D(130) \quad \checkmark \quad \checkmark$$
$$0{,}338\ \text{m}=D \quad \checkmark$$

✓ formula
✓✓both values units per minute
✓simplify

(4)

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4.2.2 $w = 2\pi n$ ✓

$w = 2\pi(\frac{130}{60})$ ✓

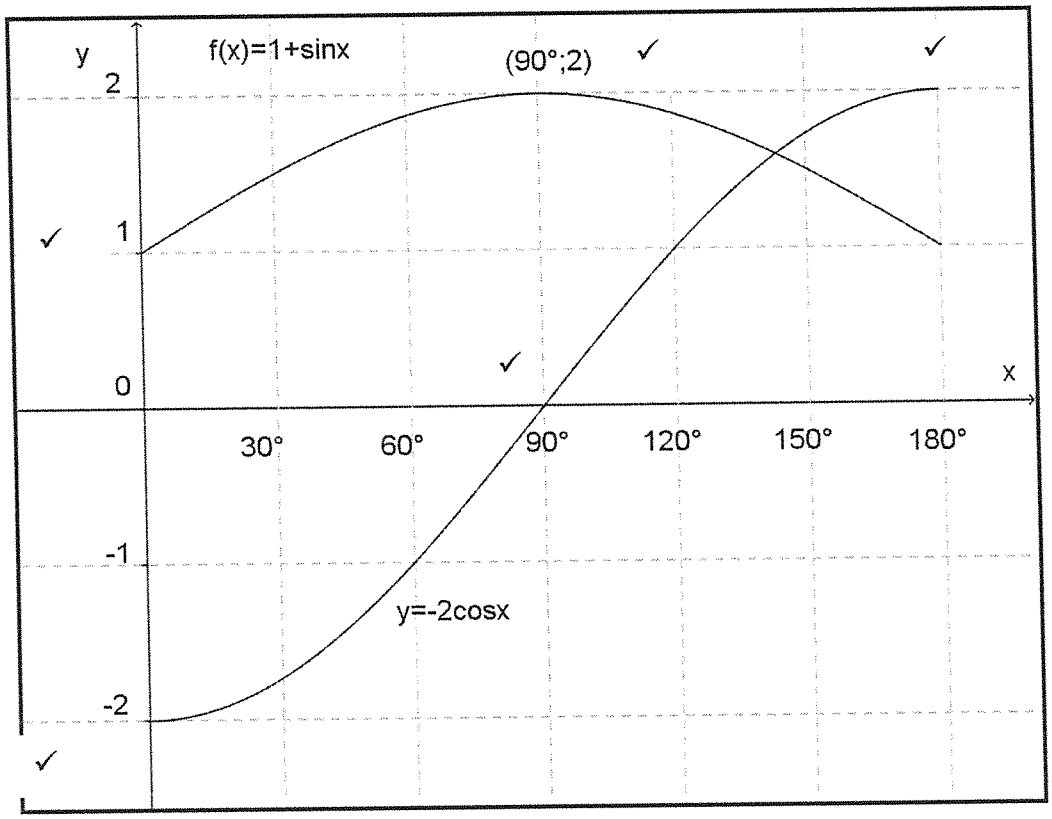
$w = 13,614$ rad/s ✓

✓formula
✓substitution
✓simplify

(3)
[14]

QUESTION 5

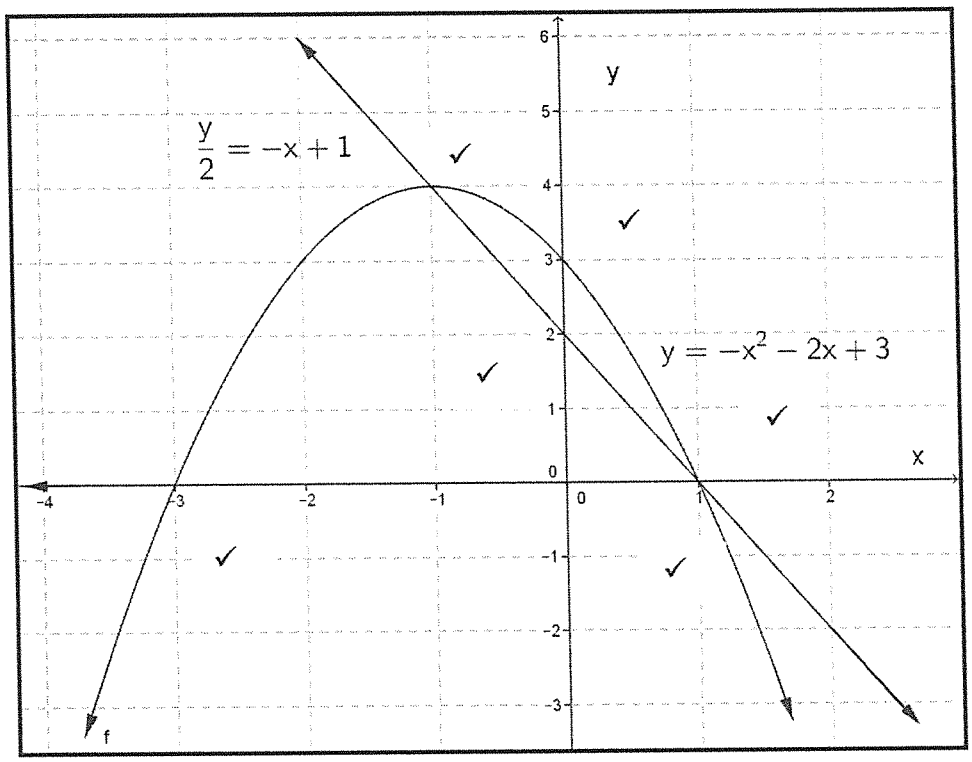
5.1



✓✓y-intercepts
✓x-intercept
✓turning point
✓shape

(5)

5.2 5.2.1



✓✓y-intercepts
✓✓x-intercepts
✓turning point
✓shapes

(6)

5.2.2 (-1; 4) and (1;0) ✓ ✓

✓follow up on students graph

(2)
[13]

QUESTION 6

6.1 $\frac{7}{9}\times 90^{o} = \frac{7}{9}\times\frac{\pi}{2} = 1,222 \text{ rad}$ ✓ ✓

✓✓correct rounded off to three places after the comma

(2)

6.2 $e^{o} - \log_3 1 + \cos^2 0^{o} + 0,25\cos\left(\ln\frac{\pi}{4}\right)$ ✓

$= 1 - 0 + 1 + 0,243$ ✓

$= 2,243$

✓✓correct rounded off to three places after the comma

(2)

6.3 $\cos\beta = 0,6$ ✓

$\beta = 53,13^{o}$ ✓

or

$\beta = 306,87^{o}$ ✓

✓ratio
✓✓two angles

(3)

6.4 $$\frac{\sin(180^\circ-\theta)\sin(360^\circ-\theta)\cot(180^\circ+\theta)}{\cos(360^\circ-\theta)\tan(180^\circ+\theta)}$$

$$=\frac{\sin\theta\times-\sin\theta\times\frac{\cos\theta}{\sin\theta}}{\cos\theta\times\frac{\sin\theta}{\cos\theta}} \quad \checkmark \quad \checkmark \quad \checkmark$$

$$=-\cos\theta \quad \checkmark$$

✓✓simplifying numerator
✓simplifying denominator
✓answer

(4)

6.5

$$\tan B=\frac{30}{3} \quad \checkmark$$

$$B=\tan^{-1}(10)=84,289^\circ \quad \checkmark \quad \checkmark$$

✓drawing up the equation
✓substituting
✓solving

(3)
[14]

TOTAL: 100

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