higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

NOVEMBER EXAMINATION

MATHEMATICS N2

18 NOVEMBER 2013

This marking guideline consists of 12 pages.

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✔ = 1 Mark
√ = ½ Mark

QUESTION 1

1.1 $$\frac{\log_x 64 + \log_x 4 - \log_x 8}{\log_x 1024}$$

$$\frac{\log_x\left(\frac{64\times 4}{8}\right)}{\log_x 1024}$$ ✔

$$\frac{\log_x 32}{\log_x 1024}$$ ✔

$$\frac{5\log_x 2}{10\log_x 2}$$ √√

$$\frac{5}{10}$$

$$\frac{1}{2} = RHS$$ ✔ (4)

1.2 $$\sqrt{\sqrt{4.83}\bullet(16,2)}^{2}$$

$$let\ x = \left((4,83)^{\frac{1}{2}}\bullet(16,2)^{2}\right)^{\frac{1}{2}}$$

$$\log x = \log\left(4,83^{\frac{1}{2}}\bullet 16,2^{2}\right)^{\frac{1}{2}}$$ √

$$\log x = \frac{1}{2}\left[\log 4,83^{\frac{1}{2}} + \log 16,2^{2}\right]$$

$$\log x = \frac{1}{2}\left[\frac{1}{2}\log 4,83 + 2\log 16,2\right]$$ √

$$\log x = \frac{1}{2}\left[\frac{1}{2}(0,684) + 2(1,21)\right]$$

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$$\log x = \frac{1}{2}[0{,}342 + 2{,}419] \checkmark\checkmark$$

$$\log x = \frac{1}{2}(2{,}761)$$

$$\log x = 1{,}381 \checkmark$$

$$x = anti\log 1{,}381$$

$$x = 24{,}044 \checkmark \quad (5)$$

1.3 $$\log x + \log 250 = 3$$

$$\log x + \log 250 = \log 1000 \surd$$

$$\log x = \log 1000 - \log 250 \surd$$

$$\log x = \frac{\log(1000)}{(250)} \checkmark$$

$$\log x = \log 4 \checkmark$$

$$x = 4 \checkmark \quad (4)$$

1.4 $$\frac{\left(a^4\right)^{n+1} \bullet \left(a^2 b\right)^{-3n}}{(ab)^{3n} \bullet b^n}$$

$$\frac{a^{4n+4} \bullet a^{-6n} b^{-3n}}{a^{3n} b^{3n} \bullet b^n} \checkmark\checkmark\checkmark$$

$$= a^{4n+4-6n-3n} b^{-3n-n}$$

$$\checkmark$$

$$= a^{-5n+4} b^{-4n} \quad (4)$$

1.5 $$\frac{x}{2} - \frac{x}{3} - 2 = 2$$

$$\frac{3x - 2x}{6} = 2 + 2 \checkmark$$

$$\frac{x}{6} = 4 \checkmark$$

$$x = 4 \times 6$$
$$x = 24 \checkmark \quad (3)$$

[20]

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QUESTION 2

2.1 2.1.1 $V = A \times h$

$V = \pi(40)^2 \times 2$ √√

$V = 10053{,}096 \ mm^3$ ✔

$= 10053{,}096 \div 1000$

$= 10{,}053 \ \ell$ ✔ (3)

2.1.2 $V = \ell^2 \times h$ *where l is the inside length*

$10053{,}096 = l^2 \times 2$ ✔

$\frac{10053{,}096}{2} = l^2$

$5026{,}548 = l^2$ √

$\sqrt{5026{,}548} = \ell$

$70{,}898 = \ell$ √

outside $70{,}898 + 20 = 90{,}898 \ mm = \ell$ ✔ (3)

2.2 r = 200 mm $\theta = 20°$

2.2.1 $\ell = \theta r$

$= \frac{20}{57{,}3} \times 200$ *or* $0{,}349x200$ √√

$= 69{,}808 \ mm$ ✔ (2)

2.2.2 $A = \frac{1}{2}\theta r^2$

$= \frac{1}{2} \times \frac{20}{57{,}3} \times 200$ *or* $0{,}5x0{,}349x200$ √√

$= 34{,}904 \ mm^2$ ✔ (2)

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2.3 $x = 25$ mm h = 8 mm

$$D = \frac{x^2}{4h} + h$$

$$= \frac{25^2}{4\times 8} + 8 \checkmark$$

$$= \frac{625}{32} + 8$$

$$= 27{,}531\ mm \checkmark$$

$$r = \frac{D}{2} = \frac{27{,}531}{2} = 13{,}766\ mm \checkmark \quad (3)$$

2.4 N = 560 r/min D = 150 mm

2.4.1
$$V = \frac{\pi DN}{60}$$

$$V = \frac{\pi 0{,}15\times 560}{60} \checkmark$$

$$= 4{,}398\ m/s \checkmark \quad (2)$$

2.4.2
$$W = \frac{2\pi N}{60}$$

$$W = \frac{2\pi 560}{60} \checkmark$$

$$= 58{,}643\ rad/s \checkmark \quad (2)$$

2.5
$$A = d\left[\frac{0_1 + 0_L}{2} + 0_2 + 0_3 + \cdots\right]$$

$$A = 3\left[\frac{0+0}{2} + 4 + 8 + 6 + 2\right] \checkmark$$

$$= 3(20) \checkmark$$

$$60\ mm^2 \checkmark \quad (3)$$

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2.6 $$F = \frac{1}{2\pi\sqrt{LC}}$$

$$2\pi\sqrt{LC} = \frac{1}{F}$$ ✔

$$\sqrt{LC} = \frac{1}{2\pi F}$$ ✔

$$LC = \left(\frac{1}{2\pi F}\right)^2$$ ✔

$$C = \frac{\left(\frac{1}{2\pi F}\right)^2}{L}$$ ✔

$$C = \frac{1}{L}\left(\frac{1}{2\pi F}\right)^2$$

$$C = \frac{1}{4\pi F^2 L}$$ (4)

[24]

QUESTION 3

3.1 3.1.1 $\frac{1}{2}Cosec150°$

$$\frac{1}{2Sin150°}$$ ✔

1 ✔ (2)

3.1.2 $Tan40°42' + Sec30°40'$

$0,8601 + 1,1626$ √√

$= 2,023$ ✔ (2)

3.2 $Sin(\theta+30°)=\frac{1}{2}$

$\theta+30=Sin^{-1}0,5$

$\theta+30=30°\ (ref\ angle)$ ✔

First quadrant
$\therefore \theta+30°=30°\quad (1^{st})$

$\theta=30-30°=0°$ ✔

Second quadrant

$\theta+30°=180-30°\quad (2^{nd}\ Q)$

$\theta=150-30°=0°$

$\theta=120°$ ✔

$\therefore \theta\in(0;120)$

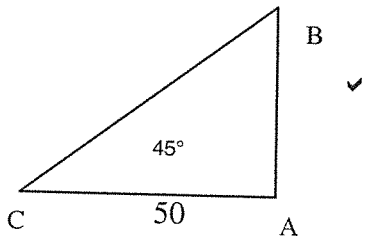
(3)

3.3

$\therefore Tan45°=\frac{BA}{50}$ ✔

$AB=50Tan45°$

$=50\ m$ ✔



(3)

3.4 $18x^2-4=0$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$x=\frac{-0\pm\sqrt{0^2-4(18)(-4)}}{2\times18}$ √√

$x=\frac{\pm\sqrt{288}}{36}$ ✔

$=\frac{\pm16,971}{36}$

$\pm0,471$ ✔

(3)

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3.5 *Father = y; Son = x*

$x+20=y$

$x-y=-20\surd$
$x+y=50\surd$
$2x=30$

$x=15$ *age of son* ✔

Substitute back
$\therefore -y=-15+(-20)$

$\therefore -y=-35$

$\therefore y=35$ *age of father* ✔ (3)
[16]

QUESTION 4

4.1 See graph on p.11

$y=-x^2+4$

x	-3	-2	-1	0	1	2	3
$y=-x^2+4$	-5	0	3	4	3	0	5

Graph: half mark for each plotted point on graph paper & 1 mark for shape and $\surd$mark for labelling (5)

4.2 See graph on p.11

$y=2$ ✔
$x-2=y$ ✔ ✔ *(x-intercept, y-intercept)* (3)

4.3 See graph on p.12

x	0	30	60	90	120	150	180
Sinx	0	0,5	0,866	1	0,866	0,5	0
2*Sinx*	0	1	1,732	2	1,732	1	0
2*Sinx* + 1	1	2	2,732	3	2,732	2	0
2*x*	0	60	120	180	240	300	360
Cosx	1	0,5	-0,5	-1	-0,5	0,5	1
2*Cos* 2*x*	2	1	-1	-2	-1	1	2

(6)
Graph ✔ ✔ ✔ ✔ ✔ ✔ *3 marks for sin-graph ; 3 marks for cos-graph*

4.4 4.4.1 $2Sinx+1=2Cos2x$

$\pm 19°$ *and* $\pm 162°$ $\surd\surd$ (1)

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4.4.2 $2Sinx = 0$

$2Sinx + 1 = 1$ ✔

$x = 0°$ *and* $180°$ ✔ ✔ (3)

4.4.3 $2Cos2x = 0$

$x = 45°$ *and* $135°$ ✔ ✔ (2)

[20]

QUESTION 5

5.1 5.1.1 $5 - \frac{45}{a^2}$

$5\left(1 - \frac{9}{a^2}\right)$ ✔

$5\left(1 - \frac{3}{a}\right)\left(1 + \frac{3}{a}\right)$ ✔ ✔ (3)

5.1.2 $6x^2 - 19 + \frac{15}{x^2}$

$\left(3x - \frac{5}{x}\right)\left(2x - \frac{3}{x}\right)$ ✔ ✔ (2)

5.1.3 $a^2(m-n) - 2a(m-n) - n + m$

$a^2(m-n) - 2a(m-n) + (m-n)$ ✔

$(m-n)(a^2 - 2a + 1)$ ✔ ✔

$(m-n)(a-1)(a-1)$ ✔ (4)

5.2 $(m-n)(a-1)^2$
$(m-n)(a-1)(m+n)$
$(a-1)(m+n)(a+1)$

HCF = $a - 1$ ✔
LCM = $(m-n)(a-1)^2(m+n)(a+1)$ ✔ ✔ ✔ (4)

5.3 5.3.1 $1+x-\frac{2x-1}{2}$

$\frac{1+x}{1}-\frac{2x-1}{2}$

$\frac{2(1+x)-(2x-1)}{2}$ ✔

$\frac{2+2x-2x+1}{2}$ ✔ $=\frac{3}{2}$ ✔ (3)

5.3.2 $\left(1-\frac{x}{y}\right)\div\left(\frac{1}{x}-\frac{1}{y}\right)$

$\left(\frac{1}{1}-\frac{x}{y}\right)\div\left(\frac{1}{x}-\frac{1}{y}\right)$

$\frac{y-x}{y}\div\frac{(y-x)}{xy}$ ✔ ✔

$\frac{y-x}{y}\times\frac{xy}{y-x}$ ✔

x ✔ (4)

[20]

TOTAL: 100

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QUESTION 4.1 and 4.2

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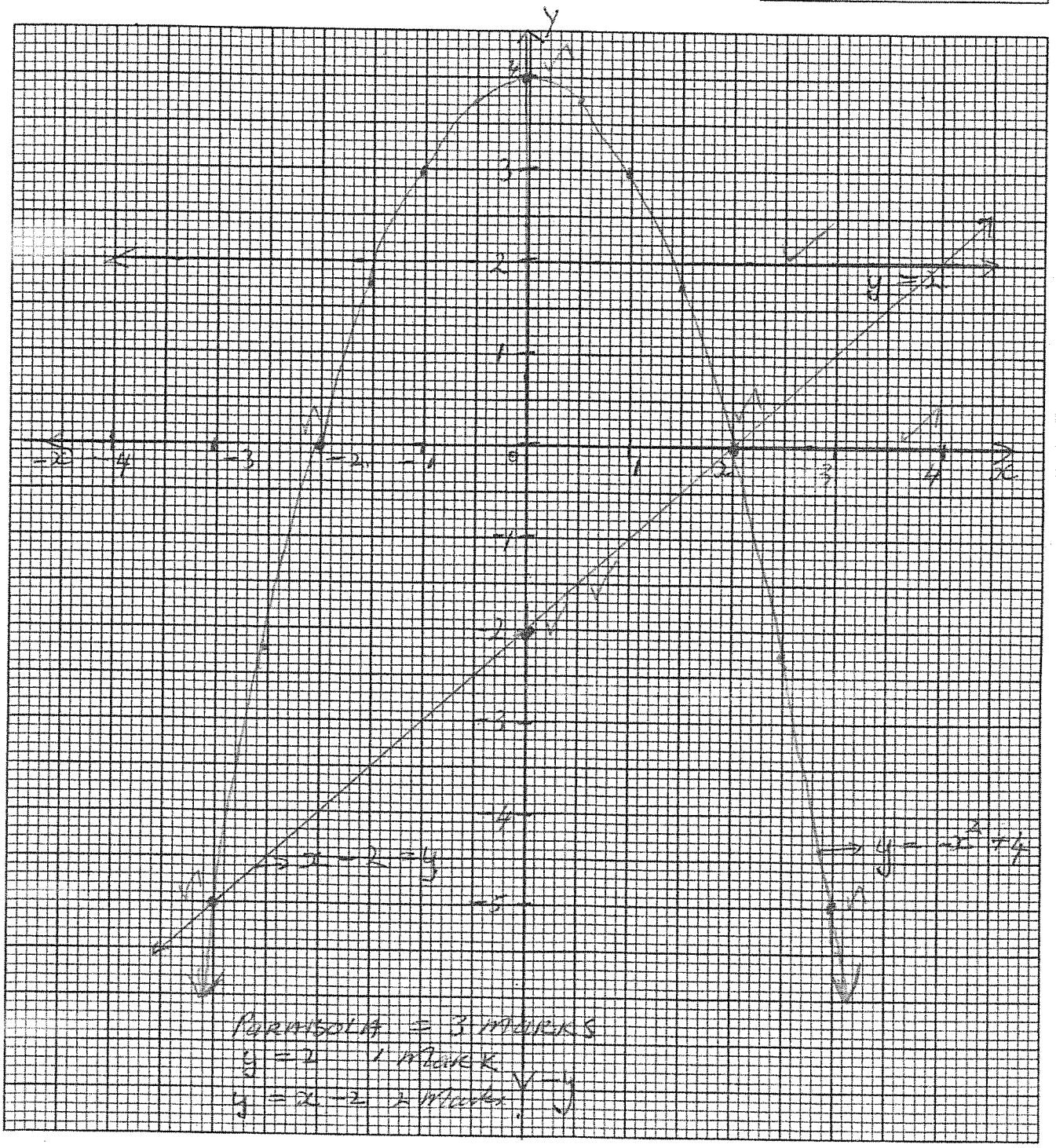
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Parabola = 3 marks
Y = 2 = 1 mark
Y = x – 2 = 2 marks

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QUESTION 4.3

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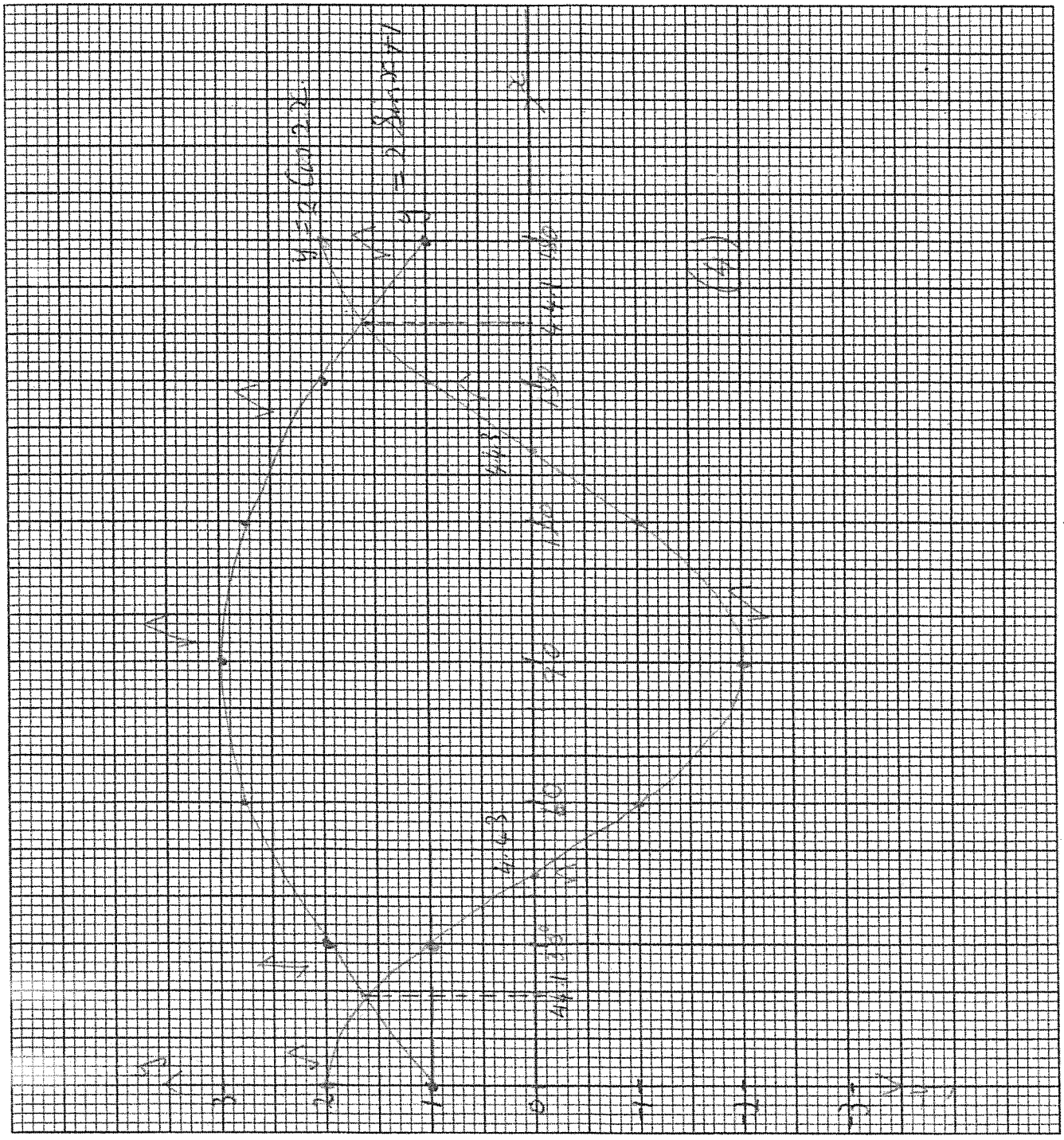
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