Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 12

JUNE/*JUNIE* 2023

TECHNICAL MATHEMATICS P1/*TEGNIESE WISKUNDE V1* MARKING GUIDELINE/*NASIENRIGLYN*

MARKS/*PUNTE*: 150

MARKING CODES/*NASIENKODES*	
A	Accuracy/*Akkuraatheid*
CA	Consistent accuracy/*Volgehoue akkuraatheid*
M	Method/*Metode*
R	Rounding/*Afronding*
NPR	No penalty for rounding/*Geen penalisering vir afronding nie*
NPU	No penalty for units omitted *Geen penalisering vir eenhede weggelaat nie*
S	Simplification/*Vereenvoudiging*
SF	Substitution in correct formula/*Vervanging in korrekte formule*

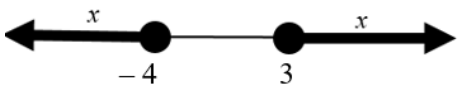
This marking guideline consists of 15 pages./
Hierdie nasienriglyn bestaan uit 15 bladsye.

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt to a question and not attempt the question again, then mark the crossed-out version should be marked.
- Consistent accuracy (CA) applies to ALL aspects of the marking guideline.
- Assuming answers/values to solve a problem is NOT acceptable.

LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Indien 'n kandidaat 'n poging kanselleer en nie poog om die vraag weer te beantwoord dan moet die gekanselleerde antwoord gemerk word.*
- *Volgehoue akkuraatheid (CA) is van toepassing op ALLE aspekte van die nasienriglyn.*
- *Die aanvaarding van antwoorde / waardes om 'n probleem op te los is NIE aanvaarbaar NIE.*

QUESTION/*VRAAG* 1				
1.1	1.1.1	$x(3x-1)=0$ $\therefore x=0$ or/*of* $x=\frac{1}{3}$	✓ $x=0$ **A** ✓ $x=\frac{1}{3}$ **A**	(2)
	1.1.2	$2x^2+13=5x$ $2x^2-15x+3=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-(-15)\pm\sqrt{(-15)^2-4(2)(3)}}{2(2)}$ $x=7,29$ or / *of* $x=0,21$	✓ Standard Form / *standaardvorm* **A** ✓ Formula / *Formule* **A** ✓ Substitution /*Vervanging* **CA** ✓ both values of *x / beide waardes van x* **CA**	(4)
	1.1.3	$(x-3)(x+4)\geq 0$ C.V / *KW*: -4 and / *en* 3 Solution / *Oplossing* $x\leq -4$ or / *of* $x\geq 3$ **OR/*OF***  	✓ Critical Values /*Kritiese waardes* **A** ✓ $x\leq -4$ **CA** ✓ or / *of* $x\geq 3$ **CA** **OR/*OF*** ✓ Correct number line / *Korrekte getal lyn* **CA**	(3)

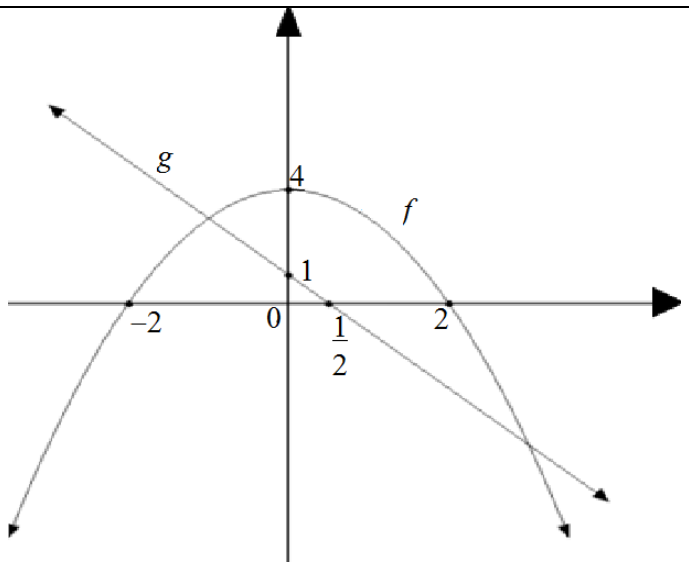
1.2	$y = x^2 - 11x + 36$ and/*en* $y = 2x - 6$ $x^2 - 11x + 36 = 2x - 6$ $x^2 - 13x + 42 = 0$ $(x-7)(x-6) = 0$ $x = 7$ or/*of* $x = 6$ $y = 2(7) - 6 = 8$ or / *of* $y = 2(6) - 6 = 6$ **OR/*OF*** $y = x^2 - 11x + 36$ $\frac{y+6}{2} = x$ $y = \left(\frac{y+6}{2}\right)^2 - 11\left(\frac{y+6}{2}\right) + 36$ $y = \left(\frac{y^2 + 12y + 36}{4}\right) - \left(\frac{11y + 66}{2}\right) + 36$ $4y = y^2 + 12y + 36 - 22y - 132 + 144$ $0 = y^2 - 14y + 48$ $(y-8)(y-6) = 0$ $y = 8$ or/*of* $y = 6$ $x = \frac{8+6}{2} = 7$ or/*of* $x = \frac{6+6}{2} = 6$	✓ Equating equations / *gelykstelling van vergl* **A** ✓ Simplification/Std form /*vereenvoudiging /std vorm* **CA** ✓ Factors/ Substitution /*faktore/ vervanging* **CA** ✓ *x*-values/*waardes* **CA** ✓ *y*-values/*waardes* **CA** **OR/*OF*** ✓ Making *x* the subject and substitution /*maak x die onderwerp en vervanging* **A** ✓ Simplification/Std form / *vereenvoudiging/std vorm* **CA** ✓ Factors/ Substitution /*faktore/vervanging* **CA** ✓ *y*-values /*waardes* **CA** ✓ *x*-values/*waardes* **CA**	(5)
1.3	1.3.1	$A = \frac{1}{2}h(a+b)$ $\frac{2A}{(a+b)} = h$	✓ *h* the subject /*die onderwerp* **A**	(1)

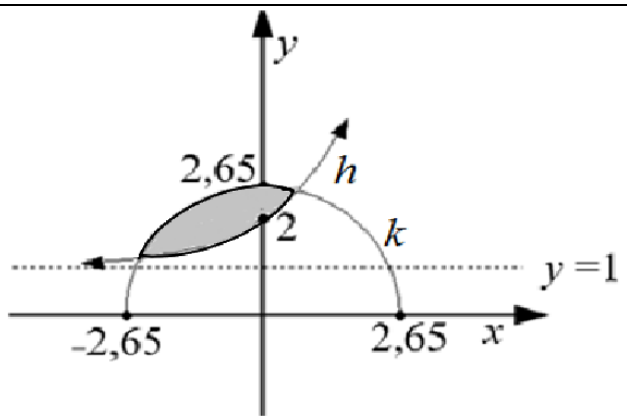
	1.3.2	$h = \frac{2\text{A}}{(a+b)}$ $= \frac{2(1,8064\times100)}{(15,24+20,32)}$ $= 10,16\text{cm}$ **OR/*OF*** $\text{A} = \frac{1}{2}h(a+b)$ $1,8064\times100 = \frac{1}{2}h(15,24+20,32)$ $\frac{180,64\times2}{35,56} = h$ $10,16 = h$	✓ Conversion /*herleiding* **A** ✓ Substitution */vervanging* **A** ✓ Simplification/ *vereenvoudiging* **A** **OR/*OF*** ✓ Conversion /*herleiding* **A** ✓ Substitution */vervanging* **A** ✓ Simplification /*vereenvoudiging* **CA**	(3)
1.4	$K = 89-16$ $= 73$ $73 = 2^6+0+0+2^3+0+0+2^0$ $K = 1001001_2$	✓ Difference /*verskil* **A** ✓ Method / *metode* **A** ✓ 1001001_2 **CA**	(3)
				[21]

QUESTION/*VRAAG* 2				
2.1	2.1.1	2 roots / *wortels*	✓ Answer /*antwoord* **A**	(1)
	2.1.2	$\Delta = b^2 - 4ac$ $= 0 - 4(1)(-121)$ $= 484$	✓ **SF** **A** ✓ Simplification / *vereenvoudiging* **CA**	(2)
	2.1.3	Roots are real, unequal, and irrational/ *Wortels is reeël,ongelyk en irrasionaal*	✓ Real, unequal and irrational / *reël,ongelyk en irrasionaal* **CA**	(1)
2.2	$x^2 + px + 4 = 0$ $\Delta = b^2 - 4ac$ $= p^2 - 4(1)(4)$ $= p^2 - 16$ $\Delta \geq 0$ $p^2 - 16 \geq 0$ $(p+4)(p-4) \geq 0$ $p \leq -4$ or / *of* $p \geq 4$		✓ **SF** **A** ✓ Simplification/*vereenvoudiging* **CA** ✓ $\Delta \geq 0$ **A** ✓ Value(s) of *p* /*waarde(s) van p* **CA**	(4)
				[8]

QUESTION/*VRAAG* 3				
3.1	3.1.1	$\frac{m^6n^7}{\left(m^2n\right)^3} = \frac{m^6n^7}{\left(m^6n^3\right)}$ $= n^4$	✓ Exponential property/ *eksponensiële eienskap* **A** ✓ n^4 **CA**	(2)
	3.1.2	$\sqrt{98x^2} + \sqrt{32x^2}$ $= \sqrt{(49\times 2)x^2} + \sqrt{(16\times 2)x^2}$ $= 7x\sqrt{2} + 4x\sqrt{2}$ $= 11x\sqrt{2}$ **OR/*OF*** $\sqrt{98x^2} + \sqrt{32x^2}$ $= \sqrt{\left(2\times 7^2\right)x^2} + \sqrt{\left(2\times 2^4\right)x^2}$ $= 7x\sqrt{2} + 2^2x\sqrt{2}$ $= 11x\sqrt{2}$	✓ Factors /*faktore* **A** ✓ Simplification / *vereenvoudiging* **CA** ✓ Simplification / *vereenvoudiging* **CA** **OR/*OF*** ✓ Prime factors/ *priemfaktore* **A** ✓ Simplification/ *vereenvoudiging* **CA** ✓ Simplification / *vereenvoudiging* **CA**	(3)
	3.1.3	$\frac{1}{2}\log_2 16 + \log_3 27$ $= \frac{1}{2}\log_2 2^4 + \log_3 3^3$ $= \frac{4}{2}\log_2 2 + 3\log_3 3$ $= 2\times 1 + 3\times 1$ $= 2$	✓ Log property/*eienskap* **A** ✓ Log property /*eienskap* **A** ✓ Simplification / *vereenvoudiging* **CA**	(3)
3.2	3.2.1	$(x+1)^3 = 64$ $(x+1)^3 = 4^3$ $x+1 = 4$ $\therefore x = 3$ **OR/*OF*** $(x+1)^3 = 64$ $(x+1)\left(x^2+2x+1\right) = 64$ $x^3+2x^2+x^2+x+2x+1-64 = 0$ $x^3+3x^2+3x-63 = 0$ $(x-3)\left(x^2+3x+21\right) = 0$ $\therefore x = 3$	✓ Exponential property / *eksponensiële eienskap* **A** ✓ Equal exponent /*gelyke eksponent* **A** ✓ $x = 3$ **CA** **OR/*OF*** ✓ Expanded form / *uitgebreide vorm* **A** ✓ Factors / *faktore* **A** ✓ $x = 3$ **CA**	(3)

	3.2.2	$\log x+1=\log(x+9)$ $\log x+\log 10=\log(x+9)$ $\log 10x=\log(x+9)$ $10x=x+9$ $9x=9$ $x=1$ **OR/*OF*** $\log x+1=\log(x+9)$ $\log x-\log(x+9)=-1\log 10$ $\log\frac{x}{(x+9)}=\log 10^{-1}$ $\frac{x}{(x+9)}=\frac{1}{10}$ $10x=x+9$ $9x=9$ $x=1$	✓ log law/*wet* **A** ✓ log law /*wet* **A** ✓ Simplification / *vereenvoudiging* **CA** ✓ $x=1$ **CA** **OR/*OF*** ✓ log law /*wet* **A** ✓ log law/*wet* **A** ✓ Simplification / *vereenvoudiging* **CA** ✓ $x=1$ **CA**	(4)
3.3	$m-(3-i)=ni+5$ $m-3+i=ni+5$ $m-3=5$ and/*en* $i=ni$ $m=8$ and/*en* $n=1$	✓ Simplification / *vereenvoudiging* **A** ✓ Value of *m* /*waarde van m* **CA** ✓ Value of *n* /*waarde van n* **CA**	(3)
3.4	$z=1-5i$ $r=\sqrt{(1)^2+(-5)^2}$ $=\sqrt{26}$ $=5,1$ $\tan\theta=-\frac{5}{1}$ *ref / verw.*$\angle$: $\theta=78,7^\circ$ $\theta=360^\circ-78,7^\circ=281,3^\circ$ $\therefore z=3,74\,cis\,281,3^\circ$	✓ **SF** **A** ✓ $r=5,1$ **CA** ✓ $\tan\theta=-5$ **CA** ✓ Ref /*verw* $\theta=78,7^\circ$ **CA** ✓ $z=5,1\,cis\,281,3^\circ$ **CA**	(5)
				[23]

QUESTION /*VRAAG* 4			
4.1.1	$y = 4$ $0 = -x^2 + 4$ $x^2 = 4$ $x = \pm 2$	✓ $y = 4$ **A** ✓ Equating to 0 /*gelyk stel aan 0* **A** ✓ $x = \pm 2$ **CA**	(3)
4.1.2	$x = 0$ and/*en* $y = 4$	✓ $x = 0$ **A** ✓ $y = 4$ **A**	(2)
4.1.3	y – int/ *afsnit* $y = 1$ x – int/ *afsnit* $0 = -2x + 1$ $-1 = -2x$ $x = \frac{1}{2}$	✓ $y = 1$ **A** ✓ $y = 0$ **A** ✓ $x = \frac{1}{2}$ **CA**	(3)
4.1.4		*f:* ✓ x – intercepts/*afsnitte* **CA** ✓ y – intercept /*afsnit* **CA** ✓ Turning point/*draaipunt* **CA** ✓ Shape /*vorm* **A** *g :* ✓ x and/*en* y-intercepts/*afsnitte* **CA** ✓ Shape/*vorm* **A**	(6)
4.1.5	$x \in \mathbb{R}$ **OR/*OF*** $-\infty \le x \le \infty$ **OR/*OF*** $x \in [-\infty; \infty]$	✓ Critical values /*kritiese waardes* **CA** ✓ Correct notation / *korrekte notasie* **A**	(2)
4.2	4.2.1 $r = \sqrt{7}$ OR / *OF* $2,65$	✓ Value of r /*waarde van r* **A**	(1)

	4.2.2	$y = 1$	✓ Equation of asymptote/*vergelyking van asimptoot* **A**	(1)
	4.2.3	$h(0) = 2^0 + 1$ $\therefore y = 2$	✓ y-intercept /*afsnit* **A**	(1)
	4.2.4	$-\sqrt{7} \le x \le \sqrt{7}$ **OR** / *OF* $x \in \left[-\sqrt{7}; \sqrt{7}\right]$ **OR** / *OF* $-2,65 \le x \le 2,65$ **OR** / *OF* $x \in [-2,65; 2,65]$	✓ Critical values /*kritiese waardes* **CA** ✓ Correct notation / *korrekte notasie* **A**	(2)
	4.2.5		*h:* ✓ Asymptote /*asimptoot* **CA** ✓ Shape /*vorm* **A** ✓ y-intercept /*afsnit* **CA** *k:* ✓ x-and/*en* y- int/*afsnit* **CA** ✓ Shape /*vorm* **A**	(5)
	4.2.6	Shaded area on the graph / *Geskakeerde gedeelte op die grafiek*	✓ Shaded area / *Geskakeerde gedeelte*	(1)
4.3	4.3.1	$0 = \frac{8}{x} + 2$ $-2 = \frac{8}{x}$ $-2x = 8$ $x = -4$	✓ $y = 0$ **A** ✓ Simplification / *vereenvoudiging* **CA** ✓ $x = -4$ **CA**	(3)
	4.3.2	$y = 2$	✓ $y = 2$ **A**	(1)
	4.3.3	$x \in \mathbb{R}, x \ne 4$	✓ $x \in \mathbb{R}, x \ne 4$ **CA**	(1)
				[32]

QUESTION /*VRAAG* 5			
5.1	$A = P(1-i)^n$ $= 300\ 000(1-0,5)^{10}$ $= 292\,000$ There will be 292 000 people in the town./ *Daar sal 292 000 mense in die dorp wees.*	✓ **F** **CA** ✓ **SF** **CA** ✓ 292 000 **CA**	(3)
5.2	$A = P(1+i)^n$ $75\ 000 = 5\ 000(1+9,5)^n$ $\frac{75\ 000}{5\ 000} = (1+9,5)^n$ $15 = (1,95)^n$ $\log_{1,95}15 = n$ $4,0550 = n$	✓ F **CA** ✓ SF **CA** ✓ Simplification / *vereenvoudiging* **CA** ✓ log form /*vorm* **CA** ✓ $n = 4$ **CA**	(5)
5.3	$A = P(1+i)^n$ $= 200\ 000\left(1+\frac{7,5\%}{12}\right)^{36}$ $= R250\ 289,23$ Amount after withdrawal / *Bedrag na onttrekking* $R250\ 289,23 - R50\,000 = R\ 200\,289,23$ Value of the investment at the end of 5 years / *Waarde van die belegging aan die einde van 5 jaar* $A = P(1+i)^n$ $= R200\ 289,23\left(1+\frac{6\%}{4}\right)^{4\times2}$ $= R225\ 624,33$	✓ **SF** **CA** ✓ R250 289,23 **CA** ✓ **M** - R50 000 **A** ✓ **SF** **CA** ✓ R225 757,96 **CA**	(5)
			[13]

QUESTION /*VRAAG* 6

6.1	$f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{1-3(x+h)-(1-3x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{1-3x-3h-1+3x}{h}$ $=\lim\limits_{h\to 0}\dfrac{-3h}{h}$ $=\lim\limits_{h\to 0}-3$ $=-3$		✓ Definition /*definisie* **A** ✓ Substitution /*vervanging* **CA** ✓ Simplification / *vereenvoudiging* **CA** ✓ Simplification / *vereenvoudiging* **CA** ✓ $f'(x)=-3$ **CA**	(5)
6.2	6.2.1	$y=\dfrac{2}{x^3}-15x+7m$ $=2x^{-3}-15x+7m$ $\dfrac{dy}{dx}=-6x^{-2}-15$	✓ $2x^{-3}$ **A** ✓ $-6x^{-2}$ **CA** ✓ -15 **CA**	(3)
	6.2.2	$D_x\left[9+2x^{-1}+\sqrt[3]{x^{27}}\right]$ $=D_x\left[9+2x^{-1}+x^9\right]$ $=-2x^{-2}+9x^8$	✓ x^9 OR / *OF* $x^{\frac{27}{3}}$ **A** ✓ $-2x^{-2}$ **CA** ✓ $9x^8$ **CA**	(3)
6.3	6.3.1	$g(x)=\dfrac{x^2}{20}-\dfrac{7x}{20}+15$ $g'(x)=\dfrac{1}{10}x-\dfrac{7}{20}$	✓ $\dfrac{1}{10}x$ **A** ✓ $-\dfrac{7}{20}$ **A**	(2)
	6.3.2	$g'(5)=\dfrac{1}{10}(5)-\dfrac{7}{20}$ $=\dfrac{3}{20}$	✓ Substitution /*vervanging* **CA** ✓ Simplification / *vereenvoudiging* **CA**	(2)
				[15]

QUESTION / *VRAAG* 7			
7.1	$h(x) = x^3 - 16x$ $0 = x(x^2 - 16)$ $0 = x(x-4)(x+4)$ $x = 0$ or/*of* $x = -4$ or/*of* $x = 4$ A$(-4;0)$ B$(4;0)$	✓ Substitution by 0 /*vervanging deur 0* **A** ✓ Factors/ Substitution / *faktore/vervanging* **CA** ✓ Coordinates of A /*koördinate van A* **CA** ✓ Coordinates of B /*koördinate van B* **CA**	(4)
7.2	$h(x) = x^3 - 16x$ $h'(x) = 3x^2 - 16$ $0 = 3x^2 - 16$ $\frac{16}{3} = x^2$ $x = \pm 2,31$ $h(2,31) = (2,31)^3 - 16(2,31) = -24,63$ $h(-2,31) = (-2,31)^3 - 16(-2,31) = 24,63$ D$(-2,31;-24,63)$ E$(2,31;24,63)$	✓ Derivative / *afgeleide* **A** ✓ $h'(x) = 0$ **A** ✓ Both x values /*beide x-waardes* **CA** ✓ y-coordinate of D / *y-koördinaat van D* **CA** ✓ y -coordinate of E / *y-koördinaat van E* **CA**	(5)
7.3	$x \le -2,31$ or / *of* $x \ge 2,31$ **OR** / *OF* $-\infty < x \le -2,31$ or/*of* $2,31 \le x < \infty$ **OR** / *OF* $x \in (-\infty;-2,31]$ or/*of* $x \in [2,31;\infty)$	✓ $-2,31$ **CA** ✓ $2,31$ **CA** ✓ correct notation / *korrekte notasie* **A**	(3)
			[12]

QUESTION / *VRAAG* 8			
8.1	$2b + 2h = 80$ $2b = 80 - 2h$ $b = 40 - h$	✓ Formula /*formule* **A** ✓ Simplification / *vereenvoudiging* **CA**	(2)
8.2	$V = l \times h \times b$ $= (20 - 2h)(40 - h) \times h$ $= 2h^3 - 100h^2 + 800h$	✓ Formula / *formule* **A** ✓ $(20 - 2h)$ **CA** ✓ **SF** **CA**	(3)
8.3	$V = 2h^3 - 100h^2 + 800h$ $\frac{dV}{dh} = 6h^2 - 200h + 800$ $0 = 6h^2 - 200h + 800$ $h = \frac{-(-200) \pm \sqrt{(-200)^2 - 4(6)(800)}}{2(6)}$ $h = 28,69$ or / *of* $h = 4,64$ $V(28,69) = 2(28,69)^3 - 100(28,69)^2 + 800(28,69)$ $= -12129,21 \text{cm}^3$ $V(4,64) = 2(4,64)^3 - 100(4,64)^2 + 800(4,64)$ $= 1758,83 \text{cm}^3$ The value of *h* is / *Die waarde van h is* 4,64	✓ Derivative / *afgeleide* **A** ✓ Derivative / *afgeleide* = 0 **A** ✓ **SF** **CA** ✓ Both values of *h / beide waardes van h* **CA** ✓ Calculating both V / *berekening beide V* **CA** ✓ Choosing/*Kies* $h = 4,64$ **CA**	(6)
			[11]

QUESTION 9				
9.1	9.1.1	$\int\left(2x^2+x\right)dx$ $=\frac{2x^3}{3}+\frac{x^2}{2}+C$	✓ $\frac{2}{3}x^3$ **A** ✓ $\frac{x^2}{2}$ **A** ✓ C **A**	(3)
	9.1.2	$\int\frac{16x^6-4x^2}{2x}\,dx$ $\int\left(8x^5-2x\right)dx$ $=\frac{8x^6}{6}-x^2$ $=\frac{4x^6}{3}-x^2+C$	✓ $8x^5$ **A** ✓ $-2x$ **A** ✓ $\frac{8x^6}{6}$ **CA** ✓ $-x^2$ +C **CA**	(4)
	9.1.3	$\int_0^2 x^3\,dx$ $=\frac{x^4}{4}\Big\vert_0^2$ $=\frac{2^4}{4}$ $=4$	✓ $\frac{x^4}{4}$ **A** ✓ Substitution / *vervanging* **CA** ✓ Simplification / *vereenvoudiging* **CA**	(3)
9.2	$A=\int_{-0,5}^{-2}\left(x^2+3x\right)dx$ $=\left[\frac{x^3}{3}+\frac{3}{2}x^2\right]_{-0,5}^{-2}$ $=\left(\frac{(-0,5)^3}{3}+\frac{3}{2}(-0,5)^2\right)-\left(\frac{(-2)^3}{3}+2(-2)^2\right)$ $A=\frac{1}{3}-\frac{16}{3}=-5$ $\therefore A = 5$ square units / *vierkante eenhede*	✓ Definite integral formula / *Bepaalde integral formule* **CA** ✓ Integral /*Integraal* **CA** ✓✓ Substitution / *vervanging* **CA** ✓ Area **CA**	(5)	
				[15]
			TOTAL/*TOTAAL*:	**150**