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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 12

SEPTEMBER 2026

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

MARKS/*PUNTE*: 150

MARKING CODES / *NASIENKODES*	
M	Method / *Metode*
A	Accuracy / *Akkuraatheid*
AO	Answer only / *Slegs antwoord*
CA	Consistent accuracy / *Deurlopende akkuraatheid*
F	Formula / *Formule*
I	Identity / *Identiteit*
R	Rounding / *Afronding*
S	Simplification / *Vereenvoudiging*
ST	Statement / *Bewering*
RE	Reason / *Rede*
ST RE	Statement and correct reason / *Bewering en korrekte rede*
SF	Substitution correctly in correct formula / *Korrekte vervanging in die korrekte formule*
NPU	No penalty for omitting units / *Geen penalisering vir eenhede uitgelaat*

This marking guideline consists of 14 pages./
Hierdie nasienriglyn bestaan uit 14 bladsye.

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NOTE:

- Continuous accuracy (CA) applies only where indicated in this marking guideline.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:

- *Volgehoue akkuraatheid (CA) is slegs van toepassing soos aangedui in hierdie nasienriglyn.*
- *Aanvaarding van waardes/antwoorde om 'n problem op te los, is onaanvaarbaar.*

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QUESTION/*VRAAG* 1

1.1.1	$x(3x-1)=0$ $x=0$ or/*of* $x=\frac{1}{3}$ **OR/ *OF*** $3x^2-x=0$ $x=\frac{-(-1)\pm\sqrt{(-1)^2-4(3)(0)}}{2(3)}$ $x=\frac{1}{3}$ or/*of* $x=0$	✓ Value of /*Waarde van x* **A** ✓ Value of /*Waarde van x* **CA** **OR/*OF*** ✓ Value of /*Waarde van x* **A** ✓ Value of /*Waarde van x* **CA** (2)
1.1.2	$-3x(2x+1)+5=4$ $-6x^2-3x+5-4=0$ $-6x^2-3x+1=0$ $x=\frac{-(-3)\pm\sqrt{(-3)^2-4(-6)(1)}}{2(1)}$ $x=4,37$ or/*of* $x=-1,37$	✓ Standard form / *standaardvorm* **A** ✓ **SF** **A** ✓✓ Each value of / *elke waarde van x* **CA** **NPR** (4)
1.2.1	$x=-4$ and/*en* $x=2$	✓ $x=-4$ **A** ✓ $x=2$ **A** (2)
1.2.2	$x\in[-4;2]$	✓ **A** (1)
1.3.1	$x+4y=0$ $x=-4y$	✓ **S** **A** (1)
1.3.2	$x^2+2xy+y=0$ $(-4y)^2+2y(-4y)+y=0$ $16y^2-8y^2+y=0$ $8y^2+y=0$ $y(8y+1)=0$ $y=0$ or/*of* $y=-\frac{1}{8}$ $x=-4(0)$ or $x=-4\left(-\frac{1}{8}\right)$ $x=0$ or/*of* $x=\frac{1}{2}$ **OR/ *OF***	✓ Substitution / *vervanging* **A** ✓ Standard form / *standaardvorm* **CA** ✓ Factors / *faktore* **CA** ✓ Both values of / *beide waardes van y* **CA** ✓ Both values of / *beide waardes van x* **CA** **OR / *OF***

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	$y=-\frac{x}{4}$ $x^2+2x\left(-\frac{x}{4}\right)-\frac{x}{4}=0$ $x^2-\frac{x^2}{2}-\frac{x}{4}=0$ $2x^2-x=0$ $x(2x-1)=0$ $x=0$ or/*of* $x=\frac{1}{2}$ $y=0$ or/*of* $y=-\frac{1}{8}$	✓ Substitution / *vervanging* ✓ Standard Form / *standaardvorm* ✓ Factors / *faktore* ✓ Both values of / *beide waardes van x* ✓ Both values / *beide waardes van y*	**A** **CA** **CA** **CA** **CA** (5)
1.4.1	$A=\frac{1}{2}(a+b)h$ $2A=(a+b)h$ $h=\frac{2A}{a+b}$	✓ Make *h* the subject / *maak h die onderwerp*	**A** (1)
1.4.2	$h=\frac{2(250)}{5+15}$ $h=25\ m$ **OR / *OF*** $A=\frac{1}{2}(a+b)h$ $250=\frac{1}{2}(5+15)h$ $250=10h$ $h=25\ m$	✓ Substitution / *vervanging* ✓ Answer / *antwoord* **OR / *OF*** ✓ Substitution / *vervanging* ✓ Answer / *antwoord*	**CA** **CA** **A** **CA** (2)
1.5.1	$\frac{3X}{Y}=\frac{3(50)}{2}$ $=75$	✓ Sub./ *vervang* ✓ Answer / *Antwoord*	**A** **CA** (2)
1.5.2	1001011_2	✓ Method / *metode* ✓ Answer / *antwoord*	**A** **CA** (2)
			[22]

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QUESTION/*VRAAG* 2

2.1.1	$\Delta = b^2 - 4ac$ $= (2)^2 - 4(1)(1)$ $= 0$	✓ **SF** ✓ $\Delta = 0$	**A** **CA** (2)
2.1.2	Roots are real, rational and equal. / *Wortels is reëel, rasionaal en gelyk*	✓ Answer/*antwoord*	**A** (1)
2.2.1	$x^2 - nx + 2x + 1 = 0$ $x^2 + (-n+2)x + 1 = 0$ **OR / *OF*** $x^2 - (n-2)x + 1 = 0$	✓ Answer/*antwoord*	**A** (1)
2.2.2	$\Delta \geq 0$ $b^2 - 4ac \geq 0$ $(-n+2)^2 - 4(1)(1) \geq 0$ $n^2 - 4n + 4 - 4 \geq 0$ $n^2 - 4n \geq 0$ $n(n-4) \geq 0$ $n \leq 0$ or/*of* $n \geq 4$	✓ $\Delta \geq 0$ ✓ Sub. / *vervang.* ✓ Factors / *faktore* ✓✓ Both values of / *beide waardes van n*	**A** **CA** **CA** **CA** (5)
			[9]

QUESTION/*VRAAG* 3

3.1.1	$\sqrt{16^x} = \left(2^{4x}\right)^{\frac{1}{2}}$ $= 2^{2x}$ **OR/*OF*** 4^x	✓ 2^{2x} **OR/*OF*** 4^x	**A** (1)
3.1.2	$\frac{\sqrt{16^x} - 2^{2x-1}}{\left(2^x\right)^2}$ $= \frac{2^{2x} - 2^{2x}.2^{-1}}{2^{2x}}$ $= \frac{2^{2x}\left(1 - 2^{-1}\right)}{2^{2x}}$ $= 1 - \frac{1}{2}$ $= \frac{1}{2}$	✓ Exp.prop/ *Eksp.eienskap* ✓ Common factor / *Gemene factor* ✓ Answer/*Antwoord* **AO: 1 mark/*punt***	**CA** **CA** **CA** (3)
3.2.1	$\log 4 - \log 2$ $= \log \frac{4}{2}$ $= \log 2$	✓ Log. Prop / *eienskap* ✓ log 2 **AO: Full mark/*Volpunte***	**A** **CA** (2)

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3.2.2	$\log 16 = a$ $\log 2^4 = a$ $4\log 2 = a$ $\log 2 = \frac{a}{4}$	✓ $4\log 2$ ✓ $\log 2 = \frac{a}{4}$	**A** **CA** (2)
3.3	$2\log x + \log 5 - \log(x-1) = \log 20$ $\log x^2 + \log 5 - \log(x-1) = \log 20$ $\log \frac{5x^2}{x-1} = \log 20$ $5x^2 = 20(x-1)$ $5x^2 - 20x + 20 = 0$ $x^2 - 4x + 4 = 0$ $(x-2)^2 = 0$ $x = 2$ **OR / *OF*** $2\log x + \log 5 - \log(x-1) = \log 20$ $\log x^2 - \log(x-1) = \log 20 - \log 5$ $\log \frac{x^2}{x-1} = \log \frac{20}{5}$ $\frac{x^2}{x-1} = 4$ $x^2 = 4(x-1)$ $x^2 - 4x + 4 = 0$ $(x-2)(x-2) = 0$ $\therefore x = 2$ **OR / *OF*** $2\log x + \log 5 - \log(x-1) = \log 20$ $\log x^2 - \log(x-1) = \log 4 + \log 5 - \log 5$ $\log \frac{x^2}{x-1} = \log 4$ $\frac{x^2}{x-1} = 4$ $x^2 = 4(x-1)$ $x^2 - 4x + 4 = 0$ $(x-2)(x-2) = 0$ $\therefore x = 2$	✓ Log. Prop / *eienskap* ✓ Log. Prop / *eienskap* ✓ Standard form / *standaardvorm* ✓ factors / *faktore* ✓ Value of / *waarde van x* **OR / *OF*** ✓ Log. Prop / *eienskap* ✓ Log. Prop / *eienskap* ✓ Standard form / *standaardvorm* ✓ factors / *faktore* ✓ Value of / *waarde van x* **OR/*OF*** ✓ Log. Prop / *eiensk* ✓ Log. Prop / *eiensk* ✓ Standard form / *standaardvorm* ✓ factors / *faktore* ✓ Value of / *waarde van x*	**A** **A** **CA** **CA** **CA** **A** **A** **CA** **CA** **CA** **A** **A** **CA** **CA** **CA** (5)

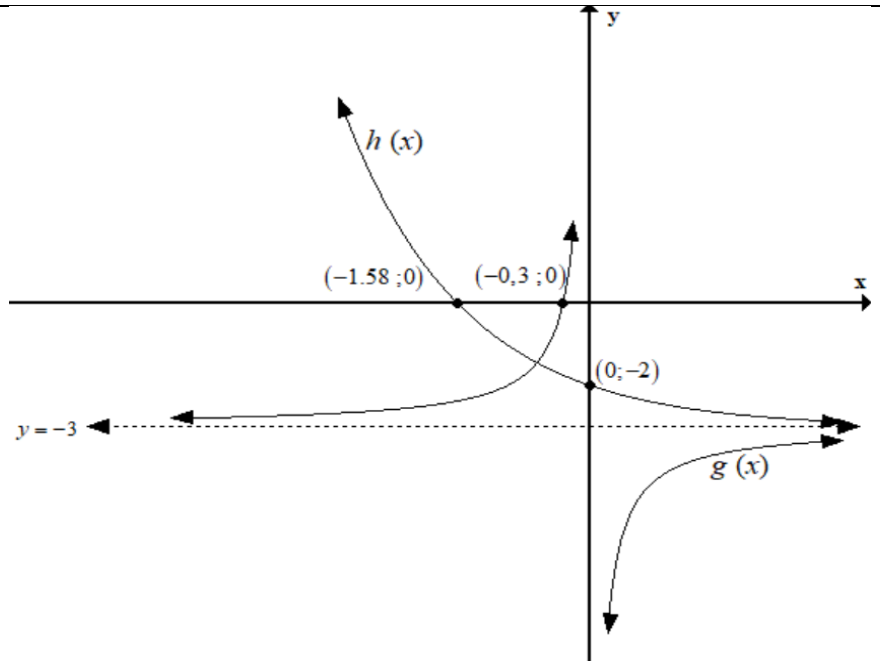
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3.4.1	$z=-2-5i$	✓ -2 ✓ $-5i$	**A** **A** (2)
3.4.2	$\tan\theta=\frac{5}{2}$ $\theta_{ref}=\tan^{-1}\left(\frac{5}{2}\right)$ $\theta_{ref}=68,20°$ $\theta=180°+68,20°$ $\theta=248,20°$ **OR/*OF*** $\tan\theta=\frac{5}{2}$ $\theta=180°+\tan^{-1}\left(\frac{5}{2}\right)$ $\theta=248,20°$	✓ Tan ratio / *verh.* ✓ Ref./*verw.* < ✓ $\theta=248,20°$ **OR/*OF*** ✓ Tan ratio / *verh* ✓ $\theta=180°+\tan^{-1}\left(\frac{5}{2}\right)$ ✓ $\theta=248,20°$	**A** **A** **CA** **CA** **A** **CA** (3)
3.4.3	$z=\sqrt{29}\left(\cos 248,20°+i\sin 248,20°\right)$	✓ Answer/*Antwoord*	**A** (1)
3.5	$i^4+pi=q-6i$ $(-1)^2=q$ or/*of* $pi=-6i$ $q=1$ or/*of* $p=-6$	✓ $i^2=-1$ ✓ Value of / *waarde van q* ✓ Value of / *waarde van p*	**A** **CA** **A** (3)
			[22]

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QUESTION/*VRAAG* 4

4.1.1	$x=0$ $y=-3$	✓ $x=1$ **A** ✓ $y=-2$ **A** (2)
4.1.2	$y=2^{-x}-3$ $0=2^{-x}-3$ $\left(\frac{1}{2}\right)^{x}=3$ $x=\log_{\frac{1}{2}}3$ **OR / *OF*** $x=-\log_2 3$ **OR / *OF*** $x=\frac{\log 3}{\log\frac{1}{2}}$ $x=-1,58$ $(-1,58;0)$ $y=2^{0}-3$ $y=-2$ $(0;-2)$	✓ $y=0$ **A** ✓ Log property/ *eienskap* **A** ✓ $x=-1,58$ **CA** ✓ $y=-2$ **CA** (4)
4.1.3	$y=\frac{-1}{x}-3$ $3x=-1$ $x=-\frac{1}{3}$ $\left(-\frac{1}{3};0\right)$	✓ $y=0$ **A** ✓ $x=-\frac{1}{3}$ **A** (2)
4.1.4	$y>-3$	✓ $y>-3$ **A** (1)
4.1.5		***g***: ✓ Shape/*vorm* **A** ✓ Asymptote/ *asimptoot* **CA** ✓ x-intercept/*afsnit* **CA** ***h***: ✓ Shape / *vorm* **A** ✓ Both intercepts / *beide afsnitte* **CA** (5)

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4.2.1	$y=-x^2-6x+7$ $(-x-7)(x-1)=0$ $x=-7$ or/*of* $x=1$ $A(-7;0)$ and/*en* $B(1;0)$ **OR/*OF*** $y=-x^2-6x+7$ $0=x^2+6x-7$ $(x+7)(x-1)=0$ $x=-7$ or/*of* $x=1$ $A(-7;0)$ and/*en* $B(1;0)$ **OR/ *OF*** $y=-x^2-6x+7$ $-x^2-6x+7=0$ $x=\frac{-(-6)\pm\sqrt{(-6)^2-4(-1)(7)}}{2(-1)}$ $x=-7$ or/*of* $x=1$ $A(-7;0)$ and/*en* $B(1;0)$	✓ Factors / *faktore* **A** ✓ $A(-7;0)$ **CA** ✓ $B(1;0)$ **CA** **OR/*OF*** ✓ Factors / *faktore* **A** ✓ $A(-7;0)$ **CA** ✓ $B(1;0)$ **CA** **OR/*OF*** ✓ **SF** **A** ✓ $A(-7;0)$ **CA** ✓ $B(1;0)$ **CA** (3)
4.2.2	$x=-\frac{(-6)}{2(-1)}$ $x=-3$	✓ **SF** **A** ✓ $x=-3$ **CA** **AO: Full Marks / *Volpunte*** (2)
4.2.3	$f(-3)=-(-3)^2-6(-3)+7$ $y=16$ $E(-3;16)$	✓ $x=-3$ **A** ✓ $y=16$ **A** (2)
4.2.4	$m_{AC}=1$ $y-7=1(x-0)$ **OR / *OF*** $y=1x+c$ $y=x+7$	✓ C (7;0) **A** ✓ $y=x+7$ **CA** (2)
4.2.5	$x<-7$ or $x>1$	✓ $x<-7$ **A** ✓ $x>1$ **A** (2)
4.3.1	$r=\sqrt{2}$	✓ $r=\sqrt{2}$ **A** (1)
4.3.2	$k(x)=-\sqrt{\left(\sqrt{2}\right)^2-x^2}$ $k(x)=-\sqrt{2-x^2}$	✓ **SF** **A** ✓ Equation / *vergelyking* **A** (2)
		[28]

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QUESTION/*VRAAG* 5

NOTE: Incorrect formula: NO MARKS
LET WEL*: *Verkeerde formule: GEEN PUNTE

5.1.1	$i_{eff} = \left(1+\frac{i_{nom}}{m}\right)^{m} - 1$ $i_{eff} = \left(1+\frac{0,105}{12}\right)^{12} - 1$ $i_{eff} = 11,02\%$	✓ **F** ✓ **SF** ✓ Answer/*antwoord*	**A** **CA** **CA** (3)
5.1.2	$A = P(1+i)^{n}$ $A = \text{R}50\,000\left(1+\frac{0,105}{12}\right)^{12\times 6}$ $A = \text{R}93\,623,62$ **OR/*OF*** $A = P(1+i)^{n}$ $A = \text{R}50\,000(1+0,1102034505)^{6}$ $A = R93\,623,62$	✓ **F** ✓ **SF** ✓ Answer/*antwoord* **OR / *OF*** ✓ **F** ✓ **SF** ✓ Answer/*antwoord*	**A** **A** **CA** **A** **A** **CA** (3)
5.2.1	$A = P(1-in)$ **OR / *OF*** $A = P\left(1-\frac{r}{100}.n\right)$	✓ Answer/*antwoord*	**A** (1)
5.2.2	$A = P(1-in)$ $3 = 12(1-6i)$ $6i = \frac{1}{4}$ $i = \frac{1}{24} \approx 0,04167$ $r = 4,17\%$	✓ **SF** ✓ Simplification/ *vereenvoudiging* ✓ Answer/*antwoord*	**A** **CA** **CA** (3)
5.3	$A = P(1+i)^{n}$ $A = \text{R}30\,000\left(1+\frac{0,043}{4}\right)^{4\times 2}\left(1+\frac{0,05}{12}\right)^{12\times 2}$ $A = \text{R}36\,108,59$ **OR/*OF*** $A = P(1+i)^{n}$ $A_1 = \text{R}30\,000\left(1+\frac{0,043}{4}\right)^{4\times 2}$ $A_1 = \text{R}32\,679,18785$ $A_{final} = \text{R}32\,679,18785\left(1+\frac{0,05}{12}\right)^{12\times 2}$ $A = \text{R}36\,108,59$	✓ **F** ✓✓ $30000\left(1+\frac{0,043}{4}\right)^{2\times 4}$ ✓ $\left(1+\frac{0,05}{12}\right)^{2\times 12}$ ✓ $A = \text{R}36\,108,59$ **OR / *OF*** ✓ **F** ✓ $\left(1+\frac{0,043}{4}\right)^{2\times 4}$ ✓ $A_1 = \text{R}32\,679,18785$ ✓ $\text{R}32\,679,18785\left(1+\frac{0,05}{12}\right)^{12\times 2}$ ✓ $A = \text{R}36\,108,59$	**A** **A** **A** **CA** **A** **A** **CA** **A** **CA** (5)
			[15]

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QUESTION/*VRAAG* 6

6.1	$f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{1-\frac{1}{2}(x+h)-\left(1-\frac{1}{2}x\right)}{h}$ $=\lim\limits_{h\to 0}\dfrac{1-\frac{1}{2}x-\frac{1}{2}h-1+\frac{1}{2}x}{h}$ $=\lim\limits_{h\to 0}\dfrac{-\frac{1}{2}h}{h}$ $=\lim\limits_{h\to 0}-\dfrac{1}{2}$ $f'(x)=-\dfrac{1}{2}$	✓ **F** ✓ **SF** ✓ Simplification/ *vereenvoudiging* ✓ Simplification/ *vereenvoudiging* ✓ Answer/*antwoord*	**A** **A** **CA** **CA** **CA** (5)
6.2.1	$y=\dfrac{5x^9}{4x^{11}}+12$ $\dfrac{d}{dx}(12)=0$	✓ 0	**A** (1)
6.2.2	$y=\dfrac{5}{4}x^{-2}+12$ $\dfrac{dy}{dx}=-\dfrac{5}{2}x^{-3}$ or $-\dfrac{5}{2x^3}$	✓ $\dfrac{5}{4}x^{-2}$ ✓ $-\dfrac{5}{2}x^{-3}$	**A** **CA** (2)
6.3	$D_x\left(2\times 4x^{\frac{3}{2}}\right)$ $=D_x\left(8x^{\frac{3}{2}}\right)$ $=12x^{\frac{1}{2}}$ or/*of* $12\sqrt{x}$	✓ $8x^{\frac{3}{2}}$ ✓ $12x^{\frac{1}{2}}$	**A** **A** (2)
6.4.1	$y=x-2x^2$ $\dfrac{dy}{dx}=1-4x$ $1-4x=9$ $x=-2$ $f(-2)=-2-2(-2)^2$ $y=-10$ $(-2;-10)$	✓ Derivative / *afgeleide* ✓ $1-4x=9$ ✓ $x=-2$ ✓ Sub. $x=-2$ ✓ $y=-10$	**A** **A** **CA** **CA** **CA** **CA** (5)
6.4.2	$y-(-10)=9(x-(-2))$ $y+10=9(x+2)$ $y=9x+8$	✓ **SF** ✓ $y=9x+8$	**CA** **CA** (2)
			[17]

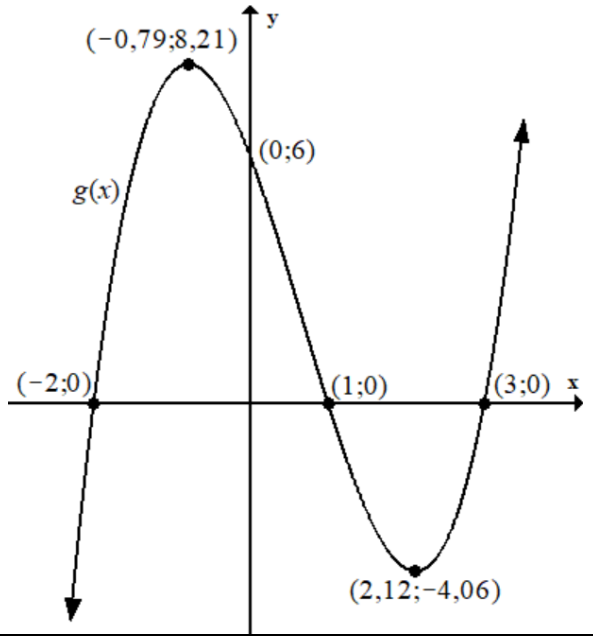
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QUESTION/*VRAAG* 7

7.1	$g(1)=0$ $(1)^3+a(1)^2-5(1)-3a=0$ $1+a-5-3a=0$ $-2a=4$ $a=-2$	✓ Sub. 1 ✓ $g(1)=0$	**A** **A** (2)
7.2	$y=-3(-2)$ $y=6$ $(0;6)$	✓ 0 ✓ 6	**A** **A** (2)
7.3	$g(x)=x^3-2x^2-5x+6$ $x=1$ 1 −2 −5 6 ↓ 1 −1 −6 1 −1 −6 0 $(x-1)(x^2-x-6)=0$ $(x-1)(x-3)(x+2)=0$ $x=1$ or/*of* $x=3$ or/*of* $x=-2$ $\therefore (1;0);\ (3;0);\ (-2;0)$ **OR / *OF*** $g(x)=x^3-2x^2-5x+6$ $x=1$ 1 −2 −5 6 ↓ 1 −1 −6 1 −1 −6 0 $(x-1)(x^2-x-6)=0$ $(x-1)=0$ or/*of* $x=\frac{-(-1)\pm\sqrt{(-1)^2-4(1)(-6)}}{2(1)}$ $x=1$ or/*of* $x=3$ or/*of* $x=-2$ $\therefore (1;0);\ (3;0);\ (-2;0)$	✓ **M** ✓ $x=1$ ✓ $x=3$ ✓ $x=-2$ **OR / *OF*** ✓ **M** ✓ $x=1$ ✓ $x=3$ ✓ $x=-2$	**A** **CA** **CA** **CA** **A** **CA** **CA** **CA** (4)
7.4	$g'(x)=3x^2-4x-5$ $3x^2-4x-5=0$ $x=\frac{-(-4)\pm\sqrt{(-4)^2-4(3)(-5)}}{2(3)}$ $x=2{,}12$ or/*of* $x=-0{,}79$ $y=-4{,}06$ or/*of* $y=8{,}21$ $(2{,}12;-4{,}06)$ and $(-0{,}79;8{,}21)$	✓ Derivative / *afgeleide* ✓ $g'(x)=0$ ✓ Factors / *faktore* ✓ Both *x*-values / *beide x-waardes* ✓ Both *y*-values / *beide y-waardes*	**A** **A** **CA** **CA** **CA** (5)

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7.5		✓ Shape / *vorm* **A** ✓ *x*-intercepts / *afsnitte* **CA** ✓ *y*-intercept / *afsnit* **CA** ✓ Both turning points / *beide draaipunte* **CA** (4)
		[17]

QUESTION/*VRAAG* 8

8.1	$V'(t)=3t^2-12t+9$	✓ Derivative / *afgeleide* **A** (1)
8.2	$V'(t)=3t^2-12t+9$ $V'(2)=3(2)^2-12(2)+9$ $V'(2)=-3$ V/s	✓ **SF** **A** ✓ Answer / *antwoord* **CA** **NPU** (2)
8.3	$V'(t)=3t^2-12t+9$ $3t^2-12t+9=0$ $t^2-4t+3=0$ $(t-3)(t-1)=0$ $t=3$ or/*of* $t=1$ $\therefore t=1$ $V_{maxi}(1)=6$ V	✓ $V'(t)=0$ **A** ✓ Standard form / *standaardvorm* **A** ✓ Factors / *faktore* **CA** ✓ $t=1$ **CA** ✓ $V_{maxi}=6$ V **CA** (5)
		[8]

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QUESTION/*VRAAG* 9

9.1.1	$\int 2^x \, dx$ $= \frac{2^x}{\ln 2} + c$	✓ $\frac{2^x}{\ln 2}$ ✓ $+c$	**A** **A** (2)
9.1.2	$\int \left(7 - 2x^{-1} + 9x^4\right) dx$ $= 7x - 2\ln x + \frac{9}{5}x^5 + c$	✓ $7x$ ✓ $-2\ln x$ ✓ $\frac{9}{5}x^5 + c$ **No penalty for omitting c** ***Geen penalisering vir die weglating van c***	**A** **A** **A** (3)
9.2	Unshaded/*Ongeskakeerde* area D $A = \int_0^4 \left(-x^2 + 2x + 8\right) dx$ $A = \left[-\frac{x^3}{3} + x^2 + 8x\right]_0^4$ $A = \left[-\frac{(4)^3}{3} + (4)^2 + 8(4)\right] - \left[-\frac{(0)^3}{3} + (0)^2 + 8(0)\right]$ $A = \frac{80}{3}$ square units / *vierkante eenhede* Shaded area C $= 36 - \frac{80}{3}$ *Geskadude area* $C = \frac{28}{3}$ square units / *vierkante eenhede*	✓ Area notation / *notasie* ✓ Integration/*integrasie* ✓ Sub $x = 4$ ✓ Sub $x = 0$ ✓ $A = \frac{80}{3}$ ✓ M ✓ $A = \frac{28}{3}$	**A** **A** **A** **A** **CA** **CA** **CA** (7)
			[12]
		TOTAL /*TOTAAL*:	**150**

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