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PROVINCIAL ASSESSMENT/ *PROVINSIALE ASSESSERING*

GRADE/GRAAD 12

TECHNICAL MATHEMATICS P1/*TEGNIJSE WISKUNDE V1* JUNE/JUNIE 2025 MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/PUNTE: 150

MARKING CODES/<i>NASIENKODES:</i>	
A	Accuracy/ <i>Akkuraatheid</i>
AO	Answers only/ <i>Slegs antwoorde</i>
CA	Consistent accuracy/ <i>Volgehoue akkuraatheid</i>
M	Method/ <i>Metode</i>
R	Rounding/ <i>Afronding</i>
NPR	No penalty for rounding/ <i>Geen penalisering vir afronding nie</i>
NPU	No penalty for units omitted/ <i>Geen penalisering vir eenhede weggelaat nie</i>
S	Simplification/ <i>Vereenvoudig</i>
SF	Substitution in correct formula/ <i>Vervanging in korrekte formule</i>
F	Correct formula/ <i>Korrekte formule</i>

These marking guidelines consist of 13 pages.

Hierdie nasienriglyne bestaan uit 13 bladsye.

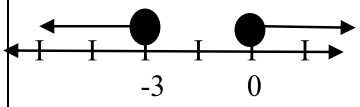
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NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy marking applies to all aspects of the marking guidelines where applicable as indicated with the marking code **CA**.
- If a candidate has crossed out (cancelled) an attempt to a question and NOT redone the solution, mark the crossed out (cancelled) version.

LET WEL:

- Indien 'n kandidaat die vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.
- Volgehoue akkuraatheid word toegepas in alle aspekte van hierdie nasienriglyne, waar nodig is dit aangedui met die merkkode **CA**.
- As 'n kandidaat 'n antwoord van 'n vraag doodtrek (kanselleer) en nie oordoen nie, sien die doodgetrekte (gekanselleerde) poging na.

QUESTION/VRAAG 1		
1.1.1	$(2 - 6x)3x = 0$ $2 - 6x = 0$ or/of $3x = 0$ $2 = 6x$ or/of $x = 0$ $\frac{1}{3} = x$ or/of $x = 0$	$\checkmark x = \frac{1}{3}$ A $\checkmark x = 0$ A AO: full marks/ volpunte (2)
1.1.2	$\frac{2}{x} = 3x - 4$ $2 = 3x^2 - 4x$ $3x^2 - 4x - 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-2)}}{2(3)}$ $x = \frac{4 \pm 2\sqrt{10}}{6}$ $x = -0,39$ or/of $x = 1,72$	$\checkmark$ standard form/ standaard vorm A $\checkmark$ SF CA $\checkmark x = -0,39$ $\checkmark x = 1,72$ CA NPR (4)
1.1.3	$x^2 + 3x \geq 0$ $x(x + 3) \geq 0$ $x = 0$ or/of $x = -3$ OR /OF $x = \frac{-(3) \pm \sqrt{(3)^2 - 4(1)(0)}}{2(1)}$ $x = 0$ or/of $x = -3$  $x \leq -3$ or/of $x \geq 0$	$\checkmark$ factors /faktore A $\checkmark$ both x-values/beide x-waardes CA $\checkmark$ number line/ getallelyn CA $\checkmark$ end points and notation/eindpunte en notasie CA (4)



1.2	$s - q = 1 \dots(1)$ $s^2 + q^2 = 5 \dots(2)$ $s = q + 1 \dots(3)$ $(q + 1)^2 + q^2 = 5$ $q^2 + 2q + 1 + q^2 - 5 = 0$ $2q^2 + 2q - 4 = 0$ $q^2 + q - 2 = 0$ $(q + 2)(q - 1) = 0$ $q = -2 \text{ or } q = 1$ $s = (-2) + 1 \text{ or/of } s = (1) + 1$ $s = -1 \text{ or/of } s = 2$ OR/OF $s - q = 1 \dots(1)$ $s^2 + q^2 = 5 \dots(2)$ $s = q + 1 \dots(3)$ $(q + 1)^2 + q^2 = 5$ $q^2 + 2q + 1 + q^2 - 5 = 0$ $2q^2 + 2q - 4 = 0$ $q = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(2)(-4)}}{2(2)}$ $q = -2 \text{ or/of } q = 1$ $s = (-2) + 1 \text{ or/of } s = (1) + 1$ $s = -1 \text{ or/of } s = 2$	✓ s or/of q subject of the formula/ <i>onderwerp van die formule</i> A ✓ SF CA ✓ standard form/ <i>standaard vorm</i> CA ✓ factors/faktore CA ✓ both s -values/ <i>beide s-waardes</i> CA ✓ both q -values/ <i>beide q-waardes</i> CA (6)
1.3	$A = P(1 + i)^n$	
1.3.1	$\frac{A}{P} = (1 + i)^n$ $\log \frac{A}{P} = \log(1 + i)^n$ $\log \frac{A}{P} = n \log(1 + i)$ $\frac{\log(\frac{A}{P})}{\log(1+i)} = n$ OR/OF $\frac{A}{P} = (1 + i)^n$ $n = \log_{(1+i)} \left(\frac{A}{P} \right)$	✓ dividing with P / <i>deel met P</i> A ✓ Log property/ <i>Log eienskap</i> A ✓ answer/ <i>antwoord</i> CA OR/OF ✓ dividing with P / <i>Deel met P</i> A ✓ change exponential to logarithm/ <i>verander eksponent na logaritmiese vorm</i> CA AO: full marks/volpunte (3)

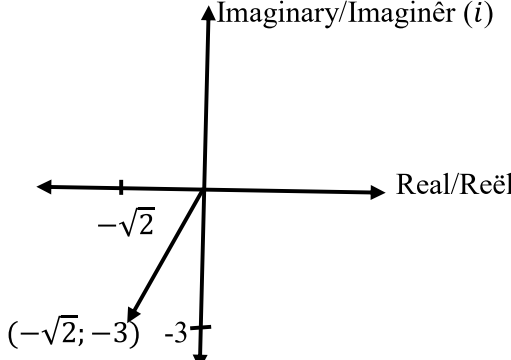


1.3.2	$n = \frac{\log(\frac{R50000}{R25000})}{\log(1+8.5\%)}$ $n = 8,5 \text{ years/jaar}$ OR/OF $n = \log_{(1+8,5\%)}\left(\frac{50000}{25000}\right)$ $8,5 \text{ years/jaar}$	✓ SF CA from/vanaf 1.3.1 ✓ answer/antwoord CA ✓ SF CA ✓ answer/antwoord CA PR: 1 mark for incorrect rounding/1 punt vir foutiewe afronding (2)																																			
1.4	A = 11001 ₂ and/en B = 101111 ₂																																				
1.4.1	$\begin{array}{r} B - A \\ 101111_2 \\ -11001_2 \\ = 10110_2 \end{array}$ OR/OF <table><tr><td>2⁶</td><td>2⁵</td><td>2⁴</td><td>2³</td><td>2²</td><td>2¹</td><td>2⁰</td></tr><tr><td>64</td><td>32</td><td>16</td><td>8</td><td>4</td><td>2</td><td>1</td></tr><tr><td></td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1₂</td></tr><tr><td>–</td><td></td><td>1</td><td>1</td><td>0</td><td>0</td><td>1₂</td></tr><tr><td>=</td><td></td><td>1</td><td>0</td><td>1</td><td>1</td><td>0₂</td></tr></table>	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	64	32	16	8	4	2	1		1	0	1	1	1	1 ₂	–		1	1	0	0	1 ₂	=		1	0	1	1	0 ₂	✓ M A ✓ answer/antwoord CA ✓ M CA ✓ answer/antwoord CA AO: full marks/volpunte (2)
2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰																															
64	32	16	8	4	2	1																															
	1	0	1	1	1	1 ₂																															
–		1	1	0	0	1 ₂																															
=		1	0	1	1	0 ₂																															
1.4.2	<table><tr><td>2⁵</td><td>2⁴</td><td>2³</td><td>2²</td><td>2¹</td><td>2⁰</td></tr><tr><td>32</td><td>16</td><td>8</td><td>4</td><td>2</td><td>1</td></tr><tr><td></td><td>1</td><td>0</td><td>1</td><td>1</td><td>0₂</td></tr></table> $10110_2 = 16 + 4 + 2$ $= 22$ OR/OF $101111_2 - 11001_2$ $= 47 - 25$ $= 22$	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	32	16	8	4	2	1		1	0	1	1	0 ₂	✓ M CA from/vanaf 1.4.1 ✓ answer/ antwoord CA AO: full marks/volpunte (2)																	
2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰																																
32	16	8	4	2	1																																
	1	0	1	1	0 ₂																																
[25]																																					



QUESTION/VRAAG 2		
2.1	$x = \frac{-2 \pm 4\sqrt{k+3}}{3}$	
2.1.1	$k = -1$ $\Delta = k + 3$ $= (-1) + 3$ $= 2$ $\therefore \Delta > 0$ the roots are real, unequal and irrational/ <i>die wortels is reël, ongelyk en irrasionaal.</i>	✓ answer/ antwoord A (1)
2.1.2	$k = -3$ $\Delta = 0$ the roots are real, equal and rational/ <i>die wortels is reël, gelyk en rasionaal.</i>	✓ answer/ antwoord A (1)
2.1.3	$k < -3$ $\Delta < 0$ the roots are non-real or imaginary/ <i>die wortels is nie-reël of imaginêr.</i>	✓ answer/ antwoord A (1)
2.2	$x^2 - x = -2 - q$ $x^2 - x + 2 + q = 0$ $\Delta > 0$ $b^2 - 4ac > 0$ $(-1)^2 - 4(1)(2 + q) > 0$ $-7 - 4q > 0$ $-7 > 4q$ $-\frac{7}{4} > q$	✓ standard form/ standaard vorm A ✓ $\Delta > 0$ A ✓ SF CA ✓ answer/ antwoord CA (4)
		[7]

QUESTION/VRAAG 3		
3.1.1	$\sqrt{3}(\sqrt{27} + 2\sqrt{3})$ $= \sqrt{3}(\sqrt{9} \times \sqrt{3} + 2\sqrt{3})$ $= \sqrt{3}(3\sqrt{3} + 2\sqrt{3})$ $= 15$	✓ surds in brackets/ wortels in hakies A ✓ answer/antwoord CA Penalty/Penaliseer: 1 mark for AO/1 punt vir AO (2)
3.1.2	$\frac{3^{3x-2}}{3^{3x+1} \cdot 9^{x-3}}$ $= \frac{3^{3x-2}}{3^{3x+1} \cdot 3^{2(x-3)}}$ $= \frac{3^{3x-2}}{3^{5x-5}}$ $= 3^{3x-5x-2-(-5)}$ $= 3^{3-2x}$ OR/OR = $\frac{3^3}{3^{2x}}$ OR/OR = $\frac{27}{3^{2x}}$	✓ prime base/ priemfaktore A ✓ product/produk /quotient rule/kwosiënt reël A ✓ answer/antwoord CA (3)

3.1.3	$\frac{\log 5 + \log 125}{\log 625 - \log 25}$ $= \frac{\log 5 + \log 5^3}{\log 5^4 - \log 5^2}$ $= \frac{\log 5 + 3\log 5}{4\log 5 - 2\log 5}$ $= \frac{\log 5(1+3)}{\log 5(4-2)}$ $= 2$	✓ prime base/ priemfaktore A ✓ log property/log eienskap CA ✓ factor/gemeenskaplike faktor CA ✓ answer/antwoord A (4)
3.2	$\log_x 64 + \log_x 8 - \log_x 32 = \log_5 625$ $\log_x \frac{64 \times 8}{32} = \log_5 5^4$ $\log_x 16 = 4\log_5 5$ $\log_x 16 = 4(1)$ $x^4 = 16$ $x^4 = 2^4$ $x = 2$	✓ $\log_x \frac{64 \times 8}{32}$ A ✓ $\log_5 5^4$ A ✓ simplification/ vereenvoudiging CA ✓ exponential/ eksponensieël CA ✓ answer/antwoord CA AO: 1 mark/punt (5)
3.3	$z = -\sqrt{2} + 3i$	
3.3.1	$\bar{z} = -\sqrt{2} - 3i$	✓ conjugate/ gekonjugeerde A (1)
3.3.2		✓ correct quadrants/ korrekte kwadrante CA ✓ correct terminal arm/ korrekte terminaalarm CA (2)



3.3.3	$ r = \sqrt{a^2 + b^2}$ $ r = \sqrt{(-\sqrt{2})^2 + (3)^2}$ $ r = \sqrt{11}$ $\theta_{Arg} = 180^\circ + \tan^{-1}\left(\frac{b}{a}\right)$ $\theta_{Arg} = 180^\circ + \tan^{-1}\left(\frac{3}{\sqrt{2}}\right)$ $\theta_{Arg} = 180^\circ + 64,76059817 \dots^\circ$ $\theta_{Arg} = 244,76^\circ$ $z = r(\cos \theta + i \cdot \sin \theta)$ $z = \sqrt{11}(\cos(244,76^\circ) + i \cdot \sin(244,76^\circ))$	✓ SF modulus ✓ $ r = 2\sqrt{2}$ CA ✓ SF $\angle_{ref}$ CA ✓ argument CA NPR ✓ polar form/polêre vorm CA (5)
3.4	$a + bi = 2(3 - 2i) - (-5i)$ $a + bi = 6 - 4i + 5i$ $a + bi = 6 + i$ $a = 6$ and/en $b = 1$	✓ simplification/ vereenvoudiging A ✓ $a = 6$ CA ✓ $b = 1$ CA (3)
[25]		

QUESTION/VRAAG 4		
4.1	$k(x) = -x^2 + 2x + 15$ $q(x) = \frac{3}{x} - 4$	
4.1.1	$x = 0$ $y = -4$	✓ $x = 0$ A ✓ $y = -4$ A (2)
4.1.2	x -intercept/ x -afsnit, $y = 0$ $0 = \frac{3}{x} - 4$ $4x = 3$ $x = \frac{3}{4}$	✓ $q(x) = 0$ A ✓ $(\frac{3}{4}; 0)$ CA (2)
4.1.3	$-x^2 + 2x + 15 = 0$ $x^2 - 2x - 15 = 0$ $(x + 3)(x - 5) = 0$ $x = -3$ or/of $x = 5$ $(-3; 0)$ or/of $(5; 0)$	✓ factors/faktore A ✓ $(-3; 0)$ CA ✓ $(5; 0)$ CA (3)



4.1.4	$x = -\frac{b}{2a}$ $= -\frac{(2)}{2(-1)}$ $= 1$ $y = \frac{4ac - b^2}{4a}$ $= \frac{4(-1)(15) - (2)^2}{4(-1)}$ $= 16$ TP(1; 16) OR/OF $K(1) = -(1)^2 + 2(1) + 15$ $= 16$ TP(1; 16)	✓ F axis of symmetry/ <i>simmetrie-as</i> A ✓ SF A ✓ turning point/ <i>draaipunt</i> CA
4.1.5		$k(x)$ ✓ intercepts/ <i>afsnitte</i> CA ✓ turning point/ <i>draaipunt</i> CA ✓ shape/ <i>vorm</i> CA $q(x)$ ✓ asymptotes/ <i>asimptote</i> CA ✓ intercept/ <i>afsnitte</i> CA ✓ shape/ <i>vorm</i> CA (6)
4.2	$f(x) = -\sqrt{r^2 - x^2}$ $q(x) = 2x - 10$	
4.2.1	$x^2 + y^2 = r^2$ $A(3; -4)$ $(3)^2 + (-4)^2 = r^2$ $25 = r^2$ $y = -\sqrt{25 - x^2}$	✓ $g(x) = 0$ CA ✓ equation/ <i>vergelyking</i> CA (2)
4.2.2	$B(0; -5)$	✓ answer/ <i>antwoord</i> CA (1)

4.2.3	Domain/ <i>Definisieversameling</i> : $-5 \leq x \leq 5$ OR/OF $x \in [-5; 5]$ Range/ <i>Waardeversameling</i> : $-5 \leq y < 0$ OR/OF $y \in [-5; 0)$	✓ end points/ <i>eindpunte</i> CA ✓ notation/ <i>notasie</i> ✓ end points/ <i>eindpunte</i> CA ✓ notation/ <i>notasie</i> (4)
4.2.4	$3 \leq x \leq 5$ OR/OF $x \in [3; 5]$	✓ end points/ <i>eindpunte</i> CA ✓ notation/ <i>notasie</i> (2)
[25]		

QUESTION/VRAAG 5		
5.1	$i_{eff} = (1 + \frac{i}{m})^m - 1$ $i_{eff} = (1 + \frac{11,5\%}{52})^{1 \times 52} - 1$ $i_{eff} = 0,12173099529 \times 100$ $i_{eff} = 12,17\%$	✓ formula/ <i>formule</i> A ✓ SF A ✓ answer/ <i>antwoord</i> CA (3)
5.2	$A = P(1 - in)$ $\frac{1}{2}P = P(1 - 0,15n)$ $0,5 = 1 - 0,15n$ $0,15n = 1 - 0,5$ $n = \frac{0,5}{0,15}$ $n = 3,33 \text{ years/jaar}$	✓ formula/ <i>formule</i> A ✓ SF CA ✓ simplification/ <i>vereenvoudiging</i> CA ✓ answer/ <i>antwoord</i> CA (4)
5.3	$A = P(1 + i)^n$ $A = R25\,000(1 + \frac{7,5\%}{12})^{2,5 \times 12}$ $A = R30\,138,1652589$ $A = R30\,138,1652589(1 + \frac{8\%}{4})^{4 \times 0,5}$ $A = R31\,355,7471354 + R7500$ $A = R38\,855,7471354(1 + \frac{8\%}{4})^{2 \times 4}$ $A = R45\,525,7006369959$ $A = R45\,525,70$	✓ formula/ <i>formule</i> A ✓ SF ✓ R30 138,1652589 CA ✓ $(1 + \frac{8\%}{4})^{4 \times 0,5}$ ✓ $(1 + \frac{8\%}{4})^{4 \times 2}$ ✓ $A = R45\,525,70$ CA



	OR/OF $A = P(1 + i)^n$ $A = R25\,000\left(1 + \frac{7,5\%}{12}\right)^{2,5 \times 12} \times \left(1 + \frac{8\%}{4}\right)^{2,5 \times 4}$ $+ R7\,500 \left(1 + \frac{8\%}{4}\right)^{2 \times 4}$ $A = R45\,525,7006369959$ $A = R45\,525,70$	OR/OF ✓ formula/formule A ✓ $R25\,000\left(1 + \frac{7,5\%}{12}\right)^{2,5 \times 12}$ ✓ $\left(1 + \frac{8\%}{4}\right)^{2,5 \times 4}$ ✓ $+R7500$ ✓ $\left(1 + \frac{8\%}{4}\right)^{2 \times 4}$ ✓ $A=R45\,525,70$ CA NPR (6)
[13]		

QUESTION/VRAAG 6		
6.1	$f(x) = 5 - \frac{2}{3}x$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{5 - \frac{2}{3}(x+h) - (5 - \frac{2}{3}x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{5 - \frac{2}{3}x - \frac{2}{3}h - 5 + \frac{2}{3}x}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-\frac{2}{3}h}{h}$ $f'(x) = -\frac{2}{3}$	✓ formula/formule A ✓ SF CA ✓ simplification/ vereenvoudiging CA ✓ $= \lim_{h \rightarrow 0} \frac{-\frac{2}{3}h}{h}$ CA ✓ answer/antwoord CA (5)
6.2.1	$\frac{dv}{dr} = \frac{2}{3}\pi r^2 h$ $= \frac{4}{3}\pi r h$	✓ answer/antwoord CA (1)
6.2.2	$D_x \left[\sqrt[3]{x^4} + \frac{x^2 - \sqrt{3}x^6}{x^3} \right]$ $D_x \left[x^{\frac{4}{3}} + x^{-1} - \sqrt{3}x^3 \right]$ $= \frac{4}{3}x^{\frac{1}{3}} - x^{-2} - 3\sqrt{3}x^2$ $= \frac{4}{3}x^{\frac{1}{3}} - \frac{1}{x^2} - 3\sqrt{3}x^2$	✓ $x^{\frac{4}{3}} + x^{-1} - \sqrt{3}x^3$ A ✓ $\frac{4}{3}x^{\frac{1}{3}}$ CA ✓ $-\frac{1}{x^2}$ CA ✓ $-3\sqrt{3}x^2$ CA (4)
6.3	$g(x) = 3x^2 + x$	
6.3.1	$g'(x) = 6x + 1$ $x = 2$ $g'(x) = m$ $6(2) + 1 = m$ $13 = m$	✓ $g'(x) = 6x + 1$ A ✓ substitution/substitusie CA ✓ answer/antwoord CA (3)

6.3.2	$g(2) = 3(2)^2 + 2$ $= 14$ $y - y_1 = m(x - x_1)$ $y - 14 = 13(x - 2)$ $y - 14 = 13x - 26$ $y = 13x - 12$	✓ y-value/waarde A ✓ substitution/substitusie CA ✓ equation/vergelyking CA (3)
6.3.3	$g(1) = 3(1)^2 + (1) = 4$ (2; 14) and/en (1; 4) Average gradient/Gemiddelde gradiënt = $\frac{f(b)-f(a)}{b-a}$ $= \frac{14-4}{2-1}$ $= 10$	✓ SF CA ✓ answer/antwoord CA (2)
[18]		

QUESTION/VRAAG 7		
7.1.1	$f(x) = a(x - x_1)(x - x_2)(x - x_3)$ (-3; 0) (-1; 0) (2; 0) $f(x) = a(x - (-3))(x - (-1))(x - 2)$ $f(x) = a(x + 3)(x^2 - x - 2)$ $f(x) = a(x^3 + 2x^2 - 5x - 6)$ (0; 6) $6 = a((0)^3 + 2(0)^2 - 5(0) - 6)$ $6 = -6a$ $-1 = a$ $f(x) = -1(x^3 + 2x^2 - 5x - 6)$ $f(x) = -x^3 - 2x^2 + 5x + 6$ $b = -2; c = 5; d = 6$	✓ SF A ✓ simplification/ vereenvoudiging CA ✓ $-1 = a$ CA ✓ $b = -2$ CA ✓ $c = 5$ CA ✓ $d = 6$ CA (6)
7.1.2	$f'(x) = -3x^2 - 4x + 5$ $f'(x) = 0$ $-3x^2 - 4x + 5 = 0$ $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(-3)(5)}}{2(-3)}$ $x = 0,79$ or/of $x = -2,12$ $f(-2,12) = -(-2,12)^3 - 2(-2,12)^2 + 5(-2,12) + 6$ $= -4,06$ R(-2,12; -4,06) $f(0,79) = -(0,79)^3 - 2(0,79)^2 + 5(0,79) + 6$ $= 8,21$ T(0,79; 8,21)	✓ $f'(x)$ A ✓ $f'(x) = 0$ CA from/vanaf 7.1.1 ✓ factors/faktore CA ✓ both x-values/ beide x-waardes CA ✓ R and/en T CA (5)



7.2.1	$-3 \leq x \leq -1$ and/en $x \geq 2$ OR/OF $x \in [-3; -1]$ and/en $x \in [2; \infty)$	✓ end points/ eindpunte A ✓ notation/notasie ✓ end points/ eindpunte A ✓ notation/notasie A (4)
7.2.2	$-2,12 < x < 0,79$ OR/OF $x \in (-2,12; 0,79)$	✓ end points/ eindpunte CA from/vanaf 7.1.2 ✓ notation/notasie CA (2)
[17]		

QUESTION/VRAAG 8		
8.1	$S.A(x) = 4x + \frac{960}{x} + 240$ $S.A'(x) = 4 - 960x^{-2}$ $4 - \frac{960}{x^2} = 0$ $4x^2 = 960$ $x^2 = 240$ $x = \pm\sqrt{240}$ $x = \pm 15$ $\therefore x = 15$	✓ derivative/ afgeleide A ✓ $S.A'(x) = 0$ A ✓ factors/faktore CA ✓ x-value/ x- waarde CA Penalty: 1 mark for incorrect rounding/ Penaliseer: 1 punt vir foutiewe afronding (4)
8.2	$S.A(15) = 4(15) + \frac{960}{(15)} + 240$ $= 364 \text{ units/eenhede}^2$	✓ substitution/ substitusie CA from/vanaf 8.1 ✓ answer/antwoord CA NPR (2)
[6]		



QUESTION/VRAAG 9		
9.1.1	$\int \left(\sqrt[3]{x} + \left(\frac{1}{5}\right)^{4x} \right) dx$ $\int \left(x^{\frac{1}{3}} + \left(\frac{1}{5}\right)^{4x} \right) dx$ $= \frac{3}{4} x^{\frac{4}{3}} + \frac{\left(\frac{1}{5}\right)^{4x}}{4 \ln\left(\frac{1}{5}\right)} + C$	$\checkmark x^{\frac{1}{3}} \quad \text{A}$ $\checkmark \frac{3}{4} x^{\frac{4}{3}} \quad \text{CA}$ $\checkmark \frac{\left(\frac{1}{5}\right)^{4x}}{4 \ln\left(\frac{1}{5}\right)} \quad \text{A}$ $\checkmark C \quad \text{A}$ (4)
9.1.2	$-3 \int (x^{-1} - x) dx$ $\int (-3x^{-1} + 3x) dx$ $= -3 \ln x + \frac{3x^2}{2} + C$	$\checkmark \int (-3x^{-1} + 3x) dx$ $\checkmark -3 \ln x \quad \text{A}$ $\checkmark \frac{3x^2}{2} + C \quad \text{A}$ (3)
9.2	$A = - \int_{-2}^0 (3x^3 - 12) dx$ $A_1 = - \left[\frac{3x^4}{4} - 12x \right]_{-2}^0$ $A_1 = - \left(\frac{3(0)^4}{4} - 12(0) \right) - \left(\frac{3(-2)^4}{4} - 12(-2) \right)$ $A_1 = -(0 - 36)$ $A_1 = 36 \text{ units}^2/\text{eenhede}^2$ $A_2 = \int_0^2 (3x^3 - 12) dx$ $A_2 = \left[\frac{3x^4}{4} - 12x \right]_0^2$ $A_2 = \left(\frac{3(2)^4}{4} - 12(2) \right) - \left(\frac{3(0)^4}{4} - 12(0) \right)$ $A_2 = (36 - 0)$ $A_2 = 36 \text{ units}_2/\text{eenhede}_2$ $A_{\text{total}} = A_1 + A_2$ $A_{\text{total}} = 36 + 36$ $A_{\text{total}} = 72 \text{ units}/\text{eenhede}^2$	$\checkmark$ area notation/ oppervlakte notasie A $\checkmark$ apply integration/ toepassing van integrasie A $\checkmark$ substitution/ substitusie CA $\checkmark A_1 \quad \text{CA}$ $\checkmark$ substitution/ substitusie CA $\checkmark A_2 \quad \text{CA}$ $\checkmark$ Area _{total} / Oppervlakte _{totaal} CA (7)
[14]		
TOTAL/TOTAAL: 150		

