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JUNE EXAMINATION/*JUNIE EKSAMEN* GRADE/*GRAAD* 12

2024

MARKING GUIDELINES/*NASIENRIGLYNE*

TECHNICAL MATHEMATICS/*TEGNIESE WISKUNDE*

(PAPER/*VRAESTEL* 1)

Marking Codes/ <i>Nasienkodes</i>	
A	Accuracy/ <i>Akkuraatheid</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</i>
NPU	No penalty for units omitted/ <i>Geen penalisering vir weggelate eenhede</i>
S	Simplification/ <i>Vereenvoudiging</i>
SF	Substitution in correct formula/ <i>Vervanging in korrekte formule</i>
ST	Statement/ <i>Stelling</i>
ST/RE	Statement and Reason/ <i>Stelling en Rede</i>
RE	Reason/ <i>Rede</i>

NOTE/LET WEL:

- If a candidate answers a question TWICE, mark only the FIRST attempt/
Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die eerste poging na.
- If a candidate has crossed out an attempt to answer the question and did not redo it, mark the crossed-out version/
Indien 'n kandidaat 'n antwoord doodgetrek het, maar dit nie oorgedoen het nie, merk die doodgetrekte weergawe.
- Consistent accuracy applies in all aspects of the marking guidelines, where indicated.
Volgehoue akkuraatheid is deurgaans op alle aspekte van die nasienriglyne van toepassing soos aangedui..

15 pages/*bladsye*



SA EXAM
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**MARKING GUIDELINES/
NASIENRIGLYNE**

**TECHNICAL MATHEMATICS/TEGNIесе WISKUNDE
(PAPER/VRAESTEL 1)**

GR12 0624

QUESTION/VRAAG 1				CL	
1.1	1.1.1	$x(x - 10) = 0$ $x = 0$ or/of $x = 10$	$\checkmark x = 0$ A $\checkmark x = 10$ A	(2)	1D
	1.1.2	$7x^2 - 5x - 6 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(7)(-6)}}{2(7)}$ $x = \frac{5 \pm \sqrt{193}}{14}$ $x = 1,35$ or/of $x = -0,64$	\checkmark SF A $\checkmark x = 1,35$ CA $\checkmark x = -0,64$ CA	(3)	1D
	1.1.3	$(x + 2)(2x - 4) \geq 0$ $x = -2$ or/of $x = 2$ $x \leq -2$ or/of $x \geq 2$	$\checkmark x = -2$ (critical value) A or/of $x = 2$ (critical value) \checkmark Notation/Notasie CA \checkmark both end points/ <i>beide eindpunte</i> CA <div style="border: 1px solid black; padding: 2px; display: inline-block;">(Graphical representation $\frac{3}{3}$)</div>	(3)	2D
1.2		$x - 2y = 1$ and/en $x^2 + y^2 = 9 + 2xy$ $x = 1 + 2y$ $(1 + 2y)^2 + y^2 = 9 + 2y(1 + 2y)$ $1 + 4y + 4y^2 + y^2 = 9 + 2y + 4y^2$ $1 + 4y + 4y^2 + y^2 - 9 - 2y - 4y^2 = 0$ $y^2 + 2y - 8 = 0$ $(y + 4)(y - 2) = 0$	$\checkmark x = 1 + 2y$ A \checkmark SF CA \checkmark Standard form/ <i>Standaardvorm</i> CA \checkmark Factors/Faktore		4D

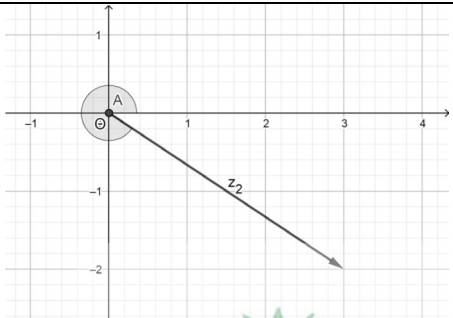
**MARKING GUIDELINES/
NASIENRIGLYNE**

**TECHNICAL MATHEMATICS/TEGNIESE WISKUNDE
(PAPER/VRAESTEL 1)**

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	OR/OF		OR/OF			
	$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $y = \frac{-(2) \pm \sqrt{(2)^2 - 4(1)(-8)}}{2(1)}$ $y = \frac{-2 \pm \sqrt{36}}{2}$ $y = 2 \text{ of } y = -4$		$x = 1 + 2(2) \text{ OR/OF } x = 1 + 2(-4)$ $x = 5 \text{ OF } x = -7$	✓ SF ✓ Both y-values <i>Beide y-waardes</i> ✓ Both x-values <i>Beide x-waardes</i>	A CA CA	(6)
1.3	1.3.1	$v = \sqrt{2gh}$ $v^2 = 2gh$ $\frac{v^2}{2g} = h$	✓ v^2 ✓ h the subject/ <i>h die onderwerp</i>	M CA	(2)	1D
	1.3.2	$\frac{v^2}{2g} = h$ $\frac{(20)^2}{2(9,80)} = h$ $h = 20 \text{ m}$ $B = 20 \text{ m}$ $A = 30 \text{ m}$	✓ Substitution/ <i>Substitusie</i> ✓ $B = 20 \text{ m}$ ✓ $A = 30 \text{ m or } 10 \text{ m}$ If learners swopped the values of A and B, full marks./Indien die leerders die waardes van A en B omgeruil het, volpunte.	CA CA CA	(3)	1D
1.4	1.4.1	1 000 000 ₂	✓ 1 000 000 ₂	A	(1)	1D
	1.4.2	64	✓ Answer/ <i>Antwoord</i>	CA	(1)	1E
					[21]	

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	3.1.3	$\frac{5^{4x} + 2 \cdot 5^{4x}}{625^x}$ $= \frac{5^{4x} + 2 \cdot 5^{4x}}{(5^4)^x}$ $= \frac{5^{4x}(1 + 2)}{5^{4x}}$ $= 3$	✓ Prime factors/ <i>Priemfaktore</i> 5^4 M ✓ Factorisation/ <i>Faktorisering</i> CA ✓ Answer/ <i>Antwoord</i> CA <div style="border: 1px solid black; padding: 2px; display: inline-block;">AO $\frac{1}{3}$</div>			2E
						(3)
3.2		$\log_2(1 - x) + \log_2(5 + x) - 3 = 0$ $\log_2(1 - x) + \log_2(5 + x) = 3$ $\log_2(1 - x)(5 + x) = 3$ $2^3 = (1 - x)(5 + x)$ $x^2 + 4x + 3 = 0$ $(x + 1)(x + 3) = 0$ OR/OF $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(3)}}{2(1)}$ $x = \frac{-4 \pm \sqrt{4}}{2}$ $x = -1$ or/of $x = -3$	✓ Log property/ <i>Log wet</i> $\log_2(1 - x)(5 + x) = 3$ A ✓ Log property/ <i>Log wet</i> $2^3 = (1 - x)(5 + x)$ CA ✓ Standard form/ <i>Standaard- vorm</i> $x^2 + 4x + 3 = 0$ CA ✓ Factors/ <i>Faktore</i> OR/OF SF A ✓ $x = -1$ or/of $x = -3$ CA			3D
						(5)
3.3	3.3.1	$z_2 = 3 - 2i$	✓ Answer/ <i>Antwoord</i>	A		(1) 1E
	3.3.2		✓ Diagram	CA		1D
						(1)

**MARKING GUIDELINES/
NASIENRIGLYNE**

**TECHNICAL MATHEMATICS/TEGNIESE WISKUNDE
(PAPER/VRAESTEL 1)**

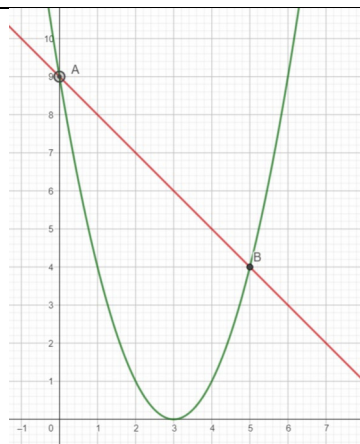
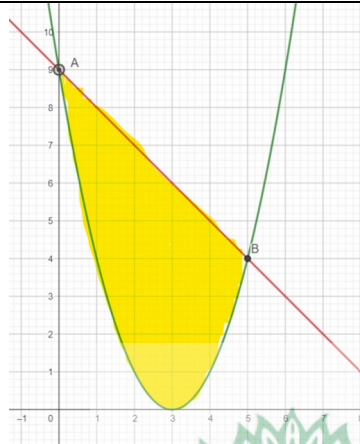
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QUESTION/VRAAG 4					
4.1	4.1.1	$y = 3$ $x = 1$	✓✓ Answer/Antwoord (Only mark $y = 3$)	A	(2) 1E
	4.1.2	$f: y = a(x - 1)^2 + 2$ through/deur $A(0; 0) / C(2; 0)$ $0 = a(0 - 1)^2 + 2$ $a = -2$ $f(x) = -2(x - 1)^2 + 2$	✓ Substitution/Substitusie ✓ $a = -2$ ✓ Answer/Antwoord	A CA CA	(3) 2D
	4.1.3	$g: y = \frac{a}{x-1} + 3$ through/deur $A(0; 0)$ $0 = \frac{a}{0-1} + 3$ $a = 3$ $g(x) = \frac{3}{x-1} + 3$	Don't mark		(0)
4.2	4.2.1	radius = 5 m	✓ 5 m	A	(1) 1E
	4.2.2	$x^2 + y^2 = 25$ $(-3)^2 + y^2 = 25$ $y^2 = 16$ $y = \pm 4$ $A(-3; -4)$ and/en $B(-3; 4)$	✓ $x^2 + y^2 = 25$ ✓ SF ✓ $y = \pm 4$ ✓ $A(-3; -4)$ $B(-3; 4)$	A A CA CA	(4) 2D
	4.2.3	$y = \sqrt{25 - x^2}$	✓✓ $y = \sqrt{25 - x^2}$	A	(2) 2D
	4.2.4	$y = -5$	✓ $y = -5$	A	(1) 1E

MARKING GUIDELINES/ NASIENRIGLYNE	TECHNICAL MATHEMATICS/TEGNIESE WISKUNDE (PAPER/VRAESTEL 1)	GR12 0624
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4.3	4.3.1	<p>For/Vir $h(x)$</p> <ul style="list-style-type: none"> ✓ Shape/Vorm A ✓ y-intercept/y-afsnit A ✓ turning point/draaipunt A <p>For/Vir $k(x)$</p> <ul style="list-style-type: none"> ✓ Shape/Vorm A ✓ y-intercept/y-afsnit A ✓ x-intercept/x-afsnit A 	(6)	1D

MARKING GUIDELINES/ NASIENRIGLYNE	TECHNICAL MATHEMATICS/TEGNIесе WISKUNDE (PAPER/VRAESTEL 1)
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4.3.2	$h(x) = (x - 3)^2$ $k(x) = -x + 9$ $(x - 3)^2 = -x + 9$ $x^2 - 6x + 9 = -x + 9$ $x^2 - 6x + 9 + x - 9 = 0$ $x^2 - 5x = 0$ $x(x - 5) = 0$ $x = 0$ or/of $x = 5$ CA $y = -(0) + 9$ $y = 9$ A(0,9) $y = -(5) + 9$ $y = 4$ B(5; 4)	$\checkmark h(x) = k(x)$ A $\checkmark M$ A If quadratic changed to linear = breakdown $\checkmark x^2 - 5x = 0$ CA \checkmark Factors/Formula/ <i>Faktore/Formule</i> CA \checkmark both x-values/ <i>beide x-waardes</i> CA \checkmark both y-values/ <i>beide y-waardes</i> CA Only coordinates/Slegs <i>koördinate</i> A(0 ; 9) B(5 ; 4) $\frac{6}{6}$	3E
4.3.3	 <p>\checkmark Answer/<i>Antwoord</i> (A) CA \checkmark Answer/<i>Antwoord</i> (B) CA</p>	(2)	1D
4.3.4	 <p>\checkmark Answer/<i>Antwoord</i> CA</p>	(1)	1D
		[28]	

**MARKING GUIDELINES/
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**TECHNICAL MATHEMATICS/TEGNIесе WISKUNDE
(PAPER/VRAESTEL 1)**

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QUESTION/VRAAG 6					
6.1	$f(x) = -2x + 3$ $f(x + h) = -2(x + h) + 3$ $f(x + h) = -2x - 2h + 3$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-2x - 2h + 3 - (-2x + 3)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-2x - 2h + 3 + 2x - 3}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-2h}{h}$ $f'(x) = -2$		<p>✓ Definition/Definisie A</p> <p>✓ SF A</p> <p>✓ S CA</p> <p>✓ S CA</p> <p>✓ -2 CA</p> <p>Answer only -1 mark</p> <p>Penalty: 1 mark for incorrect notation <i>Penaliseer: 1 punt vir verkeerde notasie</i></p>		3D
				(5)	
6.2	6.2.1	$y = 2x^2 - 4x + 6$ $y' = 4x - 4$	<p>✓ $4x$ A</p> <p>✓ -4 A</p>		2M
				(2)	
	6.2.2	$y = \sqrt{4x^3} + \frac{1}{x^5} - x$ $y = 2x^{\frac{3}{2}} + x^{-5} - x$ $\frac{dy}{dx} = 3x^{\frac{1}{2}} - 5x^{-6} - 1$ OR/OF $\frac{dy}{dx} = 3\sqrt{x} - \frac{5}{x^6} - 1$	<p>✓ $2x^{\frac{3}{2}}$ A</p> <p>✓ x^{-5} A</p> <p>✓ $3x^{\frac{1}{2}}$ / $3\sqrt{x}$ CA</p> <p>✓ $-5x^{-6}$ / $-\frac{5}{x^6}$ CA</p> <p>✓ -1 CA</p>		2D
				(5)	

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6.3	6.3.1	$h(0) = -5(0)^2 + 15(0) + 1 = 1$ $h(2) = -5(2)^2 + 15(2) + 1 = 11$ $\text{ave/gem tempo} = \frac{f(b) - f(a)}{b - a}$ $= \frac{11 - 1}{2 - 0}$ $= 5 \text{ m/s}$	$\checkmark h(0) = 1 \text{ \&}$ $h(2) = 11$ $\checkmark \text{ SF}$ $\checkmark \text{ Answer/Antwoord}$	A CA CA	(3)	2M
[15]						

QUESTION/VRAAG 7																								
7.1	12 units/eenhede		Don't mark		(0)																			
7.2	$f(1) = (1)^3 - 5(1)^2 - 8(1) + 12 = 0$ $f(1) = 0$ $\therefore (x - 1)$ is a factor/is 'n faktor		$\checkmark \text{ SF}$ $\checkmark f(1) = 0$	A A	(2)	1M																		
7.3	Synthetic division/Sintetiese deling $x = 1$ <table border="1" style="margin-left: 20px;"> <tr> <td style="text-align: center;">$x = 1$</td> <td style="text-align: center;">1</td> <td style="text-align: center;">-5</td> <td style="text-align: center;">-8</td> <td style="text-align: center;">12</td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">-4</td> <td style="text-align: center;">-12</td> <td></td> </tr> <tr style="border-top: 2px solid black;"> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">-4</td> <td style="text-align: center;">-12</td> <td style="text-align: center;">0</td> <td></td> </tr> </table> $\therefore (x - 1)(x^2 - 4x - 12) = 0$ $(x - 1)(x - 6)(x + 2) = 0$ $\therefore x = 1 \text{ or/of } x = 6 \text{ or/of } x = -2$ $\therefore C(-2; 0) \text{ and/en } E(6; 0)$	$x = 1$	1	-5	-8	12				1	-4	-12			1	-4	-12	0			Accept other methods for finding the roots such as long division./Aanvaar ander metodes om die wortels te vind soos langdeling. $\checkmark \text{ M}$ $\checkmark \text{ Factors/Faktore}$ $\checkmark x - \text{ values/waardes}$ $\checkmark C(-2; 0)$ $\checkmark E(6; 0)$ Answer only, full marks	A CA CA CA CA	(5)	2D
$x = 1$	1	-5	-8	12																				
		1	-4	-12																				
	1	-4	-12	0																				

**MARKING GUIDELINES/
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**TECHNICAL MATHEMATICS/TEGNIесе WISKUNDE
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7.4	$f(x) = x^3 - 5x^2 - 8x + 12$ $f'(x) = 3x^2 - 10x - 8$ $3x^2 - 10x - 8 = 0$ $(3x + 2)(x - 4) = 0$ <p>OR/OF</p> $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(3)(-8)}}{2(3)}$ $x = \frac{10 \pm \sqrt{196}}{6}$ $\therefore x = -\frac{2}{3} \quad \text{or/of} \quad x = 4$ $y = \left(-\frac{2}{3}\right)^3 - 5\left(-\frac{2}{3}\right)^2 - 8\left(-\frac{2}{3}\right) + 12$ $y = \frac{400}{27} = 14,8$ $y = (4)^3 - 5(4)^2 - 8(4) + 12$ $y = -36$ <p>Turning points/Draaipunte</p> $\therefore A \left(-\frac{2}{3}; 14,8\right)$ <p>and/en B (4; -36)</p>	$\checkmark f'(x)$ A $\checkmark f'(x) = 0$ A \checkmark Factors/ <i>Faktore</i> <p>OR/OF</p> SF CA \checkmark Both x-values/ <i>Beide x-waardes</i> CA \checkmark Both y-values/ <i>Beide y-waardes</i> CA CA CA $\checkmark A \left(-\frac{2}{3}; 14,8\right)$ $\checkmark B (4; -36)$	<p>2D</p> <p>(7)</p>	<p>[14]</p>
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MARKING GUIDELINES/ NASIENRIGLYNE	TECHNICAL MATHEMATICS/TEGNIESE WISKUNDE (PAPER/VRAESTEL 1)	GR12 0624
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9.2	$f(x) = -x^2 - x + 2$ $\int_{-2}^1 (-x^2 - x + 2)dx$ $= \left[-\frac{x^3}{3} - \frac{x^2}{2} + 2x \right]_{-2}^1$ $= \left(-\frac{(1)^3}{3} - \frac{(1)^2}{2} + 2(1) \right) -$ $\left(-\frac{(-2)^3}{3} - \frac{(-2)^2}{2} + 2(-2) \right)$ $= 4,5 \text{ units/eenhede}^2$	<p>✓ Area notation must be used for integrals/<i>Area notasie moet gebruik word vir integrale</i> A</p> <p>✓ $-\frac{x^3}{3} - \frac{x^2}{2} + 2x$ A</p> <p>✓ SF (1) CA ✓ SF (-2) CA</p> <p>✓ 4,5 or/of $\frac{9}{2}$ CA</p>	2D
		(5)	
		[13]	
TOTAL/TOTAAL 146			