



**GAUTENG PROVINCE**  
EDUCATION  
REPUBLIC OF SOUTH AFRICA

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

**2023**

**MARKING GUIDELINES/  
*NASIENRIGLYNE***

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

**16 pages/*bladsye***

AMENDMENT TO MARKING GUIDELINES  
JUNE 2023 PROVINCIAL COMMON EXAMINATION

ATTENTION  
THE CHIEF INVIGILATOR

SUBJECT / VAK	MATHEMATICS / WISKUNDE
PAPER / VRAESTEL	1
DATE OF EXAMINATION	9 JUNE / JUNIE 2023

The errata for the Marking Guidelines of MATHEMATICS P1 has reference.

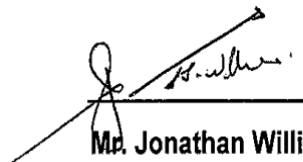
There was an typographical error in **Question 3.2** on both the English and Afrikaans versions of the question paper. This matter was addressed at the Marking Standardisation Meeting.

To ensure that candidates are not disadvantaged and prejudiced in way, you are advised to please ask your Mathematics Educator to **ignore 3.3.2** when marking.

In other words, the paper must be marked out of a total of 115 instead of 120 and then the learners' marks must be converted to a mark out of 150. E.g., Should a learner attain 85/115 then that mark is recalculated as 110/150.

Use the formula:  $\frac{a}{115} \times 100 = b$ . Then,  $\frac{b}{100} \times 150 = c$

*C is the mark that is entered into SASAMS out of 150.*

  
Mr. Jonathan Williams

DIRECTOR: EXAMINATIONS MANAGEMENT  
9 JUNE 2023

**NOTE:**

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and has not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking guidelines. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

**LET WEL:**

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aannames van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

**QUESTION/VRAAG 1**

1.1	$12x = x^2$			
1.1.1	$12x = x^2$ $x^2 - 12x = 0$ $x(x - 12) = 0$ $x = 0$ or/of $x = 12$		✓ std form/ <i>standaard vorm</i> ✓ factors/ <i>faktore</i> ✓ both answers correct/ <i>beide antwoorde korrek</i>	(3)
1.1.2	Let $p^2 - 1 = x$ $\therefore p^2 - 1 = 0$ or/of $p^2 - 1 = 12$ $p^2 = 1$ $p^2 = 13$ $p \pm 1$ $p \pm \sqrt{13}$  <b>OR/OF</b>  $p^4 - 2p^2 + 1 - 12p^2 + 12 = 0$ $p^4 - 14p^2 + 13 = 0$ $(p^2 - 1)(p^2 - 13) = 0$ $\therefore p = \pm 1$ or/of $p = \pm \sqrt{13}$		✓ subst./ <i>vervang</i> $p^2 - 1 = x$ ✓ values for/ <i>waardes van</i> $p^2$  ✓✓ roots/ <i>wortels</i>  ✓ expansion/ <i>uitbreiding</i>  ✓ factors/ <i>faktore</i> ✓✓ roots/ <i>wortels</i>	(4)
1.2	$5x^2 + 7x - 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-7) \pm \sqrt{(-7)^2 - 4(5)(-2)}}{2(5)}$ $= \frac{-(-7) \pm \sqrt{89}}{10}$ $x = 0,24$ or/of $x = -1,64$	<b>Minus 1 mark for incorrect rounding-off. If wrong formula used, Max. 2/4 for x-values (CA)/Minus 1 punt vir verkeerde afronding. As verkeerde formule gebruik is, Maks 2/4 vir x-waardes (CA)</b>	✓✓ subst. into correct formula/ <i>subt in die korrekte formule</i>  <i>vereenvoudiging</i> ✓✓ values of $x$ <i>waardes van <math>x</math></i>	(4)

1.3	$\sqrt{x+6} = x$ $\therefore x+6 = x^2$ $x^2 - x - 6 = 0$ $(x+2)(x-3) = 0$ $x = -2$ or/of $x = 3$ <i>check : <math>\sqrt{4} \neq -2</math> or/of <math>\sqrt{3+6} = 3</math></i> <i>(No solution/geen oplossing nie)</i> $\therefore x = 3$		$\checkmark$ squaring both sides $\checkmark$ std form $\checkmark$ factors $\checkmark$ x-values $\checkmark$ answer <div>Answer only: 2 marks Antwoord alleen: 2 punte</div>	(5)
1.4	$x = y - 5$ $3 = y - 5$ $\therefore y = 8$		$\checkmark$ relationship between $x$ and $y$ <i>Accept <math>x+6=y+1</math> verwantskap tussen <math>x</math> en <math>y</math></i> $\checkmark$ resultant $y$ -value/ <i>resulterende <math>y</math>-waarde</i>	(2)
1.5	1.5.1	$\frac{50}{x+31}$	$\checkmark$ answer/antwoord	(1)
1.5.2	$\frac{10}{x} + \frac{50}{x+31} = 2$ $\therefore \frac{10}{x}(x)(x+31) + \frac{50}{x+31}(x)(x+31)$ $\qquad\qquad\qquad = 2(x)(x+31)$ $\therefore 10x + 310 + 50x = 2x^2 + 62x$ $\therefore 2x^2 + 2x - 310 = 0$ $\therefore x^2 + x - 155 = 0$ $x = \frac{-1 \pm \sqrt{1 - 4(1)(-155)}}{2(1)}$ $= \frac{-1 \pm \sqrt{621}}{2}$ $x = 11,96$ or $x = -12,96$ $\therefore x = 11,96 \text{ km/h}$  or/of <div>Minus 1 mark for negative speed Minus 1 punt vir negatiewe spoed</div>		$\checkmark$ setting up equation/opstel van vergelyking  $\checkmark \checkmark$ multiplying: LHS : RHS/ <i>vermenigvuldig LK : RK</i>  $\checkmark$ std form/standardvorm  $\checkmark$ subst. into correct formula/ <i>subst. in korrekte formule</i>   $\checkmark$ answer/antwoord	(6)
				[25]

QUESTION/VRAAG 2

2.1	$S_n = k \left( 1 - \left( \frac{1}{2} \right)^n \right)$ $a = k \left( 1 - \left( \frac{1}{2} \right)^1 \right)$ $= \frac{k}{2}$ $r = \frac{1}{2}$ $\therefore 10 = \frac{k}{1 - \frac{1}{2}}$ $5 = \frac{k}{2}$ $\therefore k = 10$ $\therefore S_n = k$ $\therefore k = 10$ <p><b>OR/OF</b></p> $\left( \frac{1}{2} \right)^n \rightarrow 0 \text{ as } n \rightarrow \infty$ <p><b>OR/OF</b></p> $S_n = \frac{a(1-r^n)}{1-r}$ $= \frac{a}{1-r} (1-r^n)$ <p>but <math>S_\infty = \frac{a}{1-r} = 10</math></p> $\Rightarrow S_n = 10(1-r^n)$ <p>and <math>S_n = k \left( 1 - \left( \frac{1}{2} \right)^n \right)</math></p> $\therefore k = 10 \quad \text{and/en} \quad r = \frac{1}{2}$ <p><b>OR/OF</b></p>	$\checkmark a = \frac{k}{2}$ $\checkmark r = \frac{1}{2}$ $\checkmark \text{ subst. into correct formula/}$ $\text{subst in die korrekte formule}$ $\checkmark k = 10$ <p><b>OR/OF</b></p> $\checkmark \left( \frac{1}{2} \right)^n \rightarrow 0$ $\checkmark n \rightarrow \infty$ $\checkmark S_\infty = k$ $\checkmark k = 10$ <p><b>OR/OF</b></p> $\checkmark S_\infty = \frac{a}{1-r} = 10$ $\checkmark S_n = k \left( 1 - \left( \frac{1}{2} \right)^n \right)$ $\checkmark k = 10$ $\checkmark r = \frac{1}{2}$ <p><b>OR/OF</b></p>	<p>(4)</p> <p>(4)</p> <p>(4)</p>
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	$S_1 = \frac{k}{2}; S_2 = \frac{k}{4}; S_3 = \frac{k}{2}$ $S_{\infty} = \frac{a}{1-r} = 10$ $a = \frac{k}{2} \text{ and } r = \frac{1}{2}$ <i>and/en</i> $1 = \frac{\frac{k}{2}}{\left(1 - \frac{1}{2}\right)}$ $\therefore k = 10$	$\checkmark S_{\infty} = \frac{a}{1-r} = 10$ $\checkmark a = \frac{k}{2}$ $\checkmark r = \frac{1}{2}$ $\checkmark k = 10$	(4)
2.2	$r = \frac{1}{2}$ $\frac{a}{1 - \frac{1}{2}} = 10$ $a = 5$ $T_2 = ar = \frac{5}{2}$	$\checkmark r = \frac{1}{2}$ $\checkmark$ substitution/ <i>substitusie</i> $\checkmark a = 5$ $\checkmark$ answer/ <i>antwoord</i>	(4)
			<b>[8]</b>

**QUESTION/VRAAG 3**

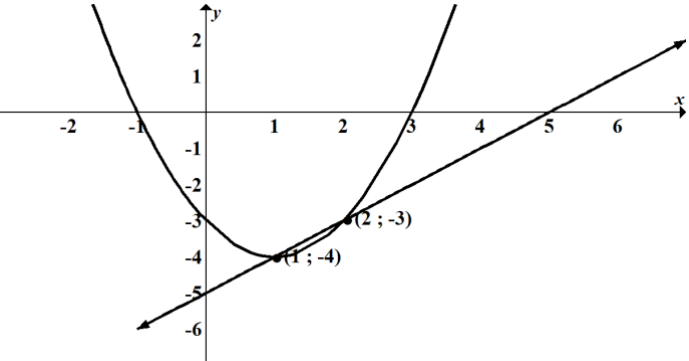
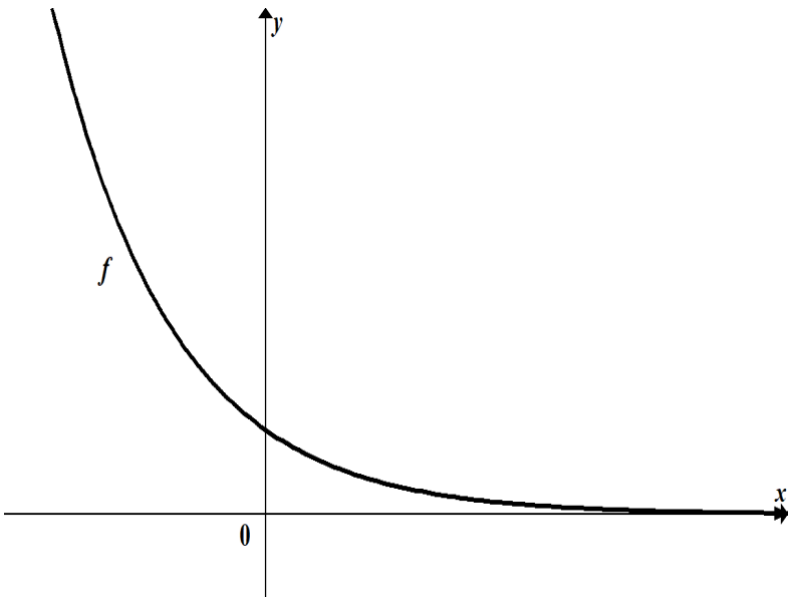
3.1	$S_n = a + (a + d) + (a + 2d) + \dots + a + (n - 1)d(1)$ $S_n = a + (n - 1)d + (a + (n - 2)d) + (a + (n - 3)d) + \dots + a(2)$ $2S_n = n(2a + (n - 1)d)$ $S_n = \frac{n}{2}(2a + (n - 1)d)$	<p>✓ first series/ <i>eerste reeks</i></p> <p>✓ series reversed/ <i>omgekeerde reeks</i></p> <p>✓ sum of series/ <i>som van die reeks</i></p> <p>✓ dividing by 2/ <i>deel deur 2</i></p>	(4)
3.2	$\sum_{p=1}^{50} (100 - 3p)$ $\sum_{p=1}^{50} (100 - 3p) = 97 + 94 + 91 + \dots$ $T_1 = a = 97$ $d = -3$ $n = 50 - 1 + 1 = 50$ $S_n = \frac{n}{2}[2a + (n - 1)d]$ $S_n = \frac{50}{2}[2(97) + (50 - 1)(-3)]$ $= 1175$ <p><b>OR/OF</b></p> $\sum_{p=1}^{50} (100 - 3p) = 97 + 94 + 91 + \dots$ $T_1 = a = 97$ $l = 100 - 3(50) = -50$ $n = 50 - 1 + 1 = 50$ $S_n = \frac{n}{2}[a + l]$ $S_n = \frac{50}{2}[97 - 50]$ $= 1175$	<p>✓ <math>a = 97</math></p> <p>✓ <math>d = -3</math></p> <p>✓ <math>n = 50</math></p> <p>✓ answer/antwoord</p> <p><b>OR/OF</b></p> <p>✓ <math>a = 97</math></p> <p>✓ <math>l = -50</math></p> <p>✓ <math>n = 50</math></p> <p>✓ answer/antwoord</p>	(4)

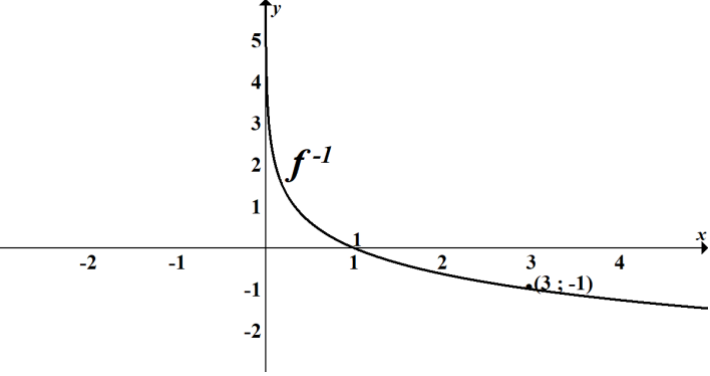


3.3	3.3.1	(a)	$T_5 - T_4 = 25$	✓ answer (1)
		(b)	$T_{70} - T_{69} = 7 + (69 - 1)6$ $= 415$	✓ subst. into correct formula/subt. in die korrekte formule  ✓ $n = 69$  ✓ answer/antwoord (3)
			<b>NB 3.3.2 is removed from the paper.</b>	
				<b>[12]</b>

QUESTION/VRAAG 4

4.1	Given/Gegee: $f(x) = x^2 - 2x - 3$ and/en $g(x) = x - 5$		
4.1.1	$f(x) = x^2 - 2x - 3$ $x = \frac{-b}{2a}$ Sub into equation or $= \frac{4ac - b^2}{4a}$ $x = \frac{-(-2)}{2(1)} = \frac{4(1)(-3) - (-2)^2}{4(1)}$ $x = 1$ $y = -4$ $\therefore TP$ is $(1; -4)$ <b>OR/OF</b> $f'(x) = 0$ $f(1) = (1)^2 - 2(1) - 3$ $f'(x) = 2x - 2 = 1 - 2 - 3$ $\therefore 2x - 2 = 0$ $f(1) = -4$ $x = 1$ $\therefore TP$ is $(1; -4)$	✓ formula (axis of symmetry)/Formule (simmetrie-as) ✓ substitution/substitusie ✓ subst. into y-formula/substitusie in y-formule <b>OR/OF</b> ✓ $f'(x) = 0$ ✓ derivative/afgeleide ✓ subst. x-values <b>OR/OF</b> Completing the square	(3)
4.1.2	$f(x) = x^2 - 2x - 3$ $(x + 1)(x - 3) = 0$ $y = (0)^2 - 2(0) - 3 = -3$ $x = -1$ and/en $x = 3$ $\therefore (0; -3) \rightarrow$ coordinate of the y-intercept/ <i>koördinate van die y-afsnit</i> are the coordinates of the x-intercept/is die <i>koördinate van die x-afsnit</i> $\therefore (-1; 0)$ and/en $(3; 0)$	✓ factors/faktore ✓ both x-values/beide x waardes ✓ y-value/y-waarde <b>NO PENALTY FOR NOT IN COORD FORM</b>	(3)
4.1.3	$x - 5 = x^2 - 2x - 3$ $x^2 - 3x + 2 = 0$ $(x - 1)(x - 2) = 0$ $x = 1$ or/of $x = 2$ $y = -4$ or/of $y = -3$ $\therefore (1; -4)$ or/of $(2; -3)$ are the points of intersection/is die snypunte	✓ std form/standaard vorm ✓ factors/faktore ✓ both x-values/beide x-waardes ✓ both y-values/beide y-waardes	(4)

	4.1.4		$f(x) = x^2 - 2x - 3$ : ✓ y-intercept/afsnit ✓ x-intercept/afsnit ✓ turning point/draaipunt ✓ $(2; -3)$ on the graph/ op die grafiek $g(x) = x - 5$ : ✓ y-intercept/afsnit ✓ x-intercept/afsnit	(6)
	4.1.5	$x \leq -1$ or $x \geq 3$	✓ roots/wortel ✓ inequality signs/ongelykheidsteken	(2)
4.2				
	4.2.1	$y = 0$	✓ answer/antwoord	(1)

4.2.2	$x = \left(\frac{1}{3}\right)^y$ $y = \log_{\frac{1}{3}} x$ <p><b>OR/OF</b></p> $x = \left(\frac{1}{3}\right)^y \rightarrow y = \log_3 x$ $x = 3^{-y} \rightarrow y = -\log_3 x$	<p>✓ swapping x- and y-values ruil die x- en y-waardes</p> <p>✓ answer/antwoord</p> <p><b>OR/OF</b></p> <p>✓ swapping x- and y-values ruil die x- en y-waardes</p> <p>✓ answer/antwoord</p>	(2)
4.2.3		<p>✓ shape/vorm</p> <p>✓ x-intercept/x-afsnit</p> <p>✓ any other point on the graph/enige ander punt op die grafiek</p> <p>NB the graph should not touch the y axis</p>	(3)
4.2.4	$x = -2$	✓✓ answer/antwoord	(2)
4.2.5	$LHS = [f(x)]^2 - [f(-x)]^2$ $= \left[\left(\frac{1}{3}\right)^x\right]^2 - \left[\left(\frac{1}{3}\right)^{-x}\right]^2$ $= 3^{-2x} - 3^{2x}$ $RHS = f(2x) - f(-2x)$ $= \left(\frac{1}{3}\right)^{2x} - \left(\frac{1}{3}\right)^{-2x}$ $= 3^{-2x} - 3^{2x}$ $\therefore LHS = RHS$ $[f(x)]^2 - [f(-x)]^2 = f(2x) - f(-2x)$	<p>✓ subst. into LHS/ subt. in die LK</p> <p>✓ subst. into RHS/ subt. in die RK</p> <p>✓ <math>3^{-2x} - 3^{2x}</math></p>	(3)
<b>[29]</b>			

**QUESTION/VRAAG 5**

	$f(x) = \frac{a}{x-p} + q$		
5.1	$p = 4$ $q = 2$ $3 = \frac{a}{5-4} + 2$ $1 = \frac{a}{1}$ $\therefore a = 1$	$\checkmark p = 4$ $\checkmark q = 2$ $\checkmark$ subst. of/van $T(5; 3)$ $\checkmark a = 1$	(4)
5.2	$y = -x + 2$ substitute/vervang (4 ; 2) $2 = -4 + c$ $c = 6$  <p style="text-align: center;"><b>OR/OF</b></p> Translation of the line $y = -x$ , 2 units up and 4 units to the right./Vertaling van die lyn $y = -x$ , 2 eenhede op en 4 eenhede na regs  $y = -(x - 4) + 2$ $y = -x + 6$ $\therefore c = 6$	$\checkmark$ subst. of/van (4; 2) $\checkmark c = 6$  <p style="text-align: center;"><b>OR/OF</b></p> $\checkmark$ subst. of/van $x - 4$ $\checkmark$ answer/antwoord	(2)  (2)
			<b>[6]</b>

**QUESTION/VRAAG 6**

6.1		$f'(x) = \lim_{h \rightarrow 0} \frac{3x - x^2 - (3(x+h) - (x+h)^2)}{h}, h \neq 0$ $= \lim_{h \rightarrow 0} \frac{3x + 3h - x^2 - 2xh - h^2 - 3x + x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{3h - 2xh - h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(3 - 2x - h)}{h}$ $= \lim_{h \rightarrow 0} (3 - 2x - h)$ $f'(x) = 3 - 2x$ <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Minus 1 mark for incorrect notation/Minus 1 punt vir verkeerde notasie</b></p> </div>	<p>✓ substitution into correct formula/substitusie in die korrekte formule</p> <p>✓ simplification/vereenvoudiging</p> <p>✓ factorization/faktorisering</p> <p>✓ answer/antwoord</p> <p>ANSWER ONLY 0/4</p>	(4)
6.2	6.2.1	$y = \frac{x - 3\sqrt{x}}{x^2}$ $y = \frac{x - 3x^{\frac{1}{2}}}{x^2}$ $y = x^{-1} - 3x^{-\frac{3}{2}}$ $\frac{dy}{dx} = -x^{-2} + \frac{9}{2}x^{-\frac{5}{2}}$	<p>✓ <math>x^{-1}</math></p> <p>✓ <math>-3x^{-\frac{3}{2}}</math></p> <p>✓ <math>-x^{-2}</math></p> <p>✓ <math>\frac{9}{2}x^{-\frac{5}{2}}</math></p>	(4)
	6.2.2	$\frac{y}{3x} = (1 + x)^2$ $\frac{y}{3x} = 1 + 2x + x^2$ $y = 3x + 6x^2 + 3x^3$ $\frac{dy}{dx} = 3 + 12x + 9x^2$	<p>✓ simplification/vereenvoudig</p> <p>✓ 3</p> <p>✓ <math>12x</math></p> <p>✓ <math>9x^2</math></p>	(4)

6.3	$h(x) = ax^2 + \frac{b}{x}$ <p>subst./vervang (2 ; 12) : <math>12 = a(2)^2 + \frac{b}{2}</math></p> $\therefore 24 = 8a + b \quad (1)$ <p>Minimum if/as: <math>h'(x) = 0</math></p> $\therefore 2ax - \frac{b}{x^2} = 0$ <p>but/maar <math>x = 2 \quad \therefore 4a - \frac{b}{4} = 0</math></p> $\therefore 16a - b = 0 \quad (2)$ <p>(1) + (2) : <math>24a = 24</math></p> <p>Subst. into/vervang in (1) : <math>8 + b = 24</math></p> $b = 16$	<p>✓ setting up equation/opstel van vergelyking</p> <p>✓ eqn (1)</p> <p>✓ <math>h'(x) = 0</math></p> <p>✓ <math>2ax - \frac{b}{x^2} = 0</math></p> <p>✓ <math>4a - \frac{b}{4} = 0</math></p> <p>✓ <math>a = 1</math></p> <p>✓ <math>b = 16</math></p>	(7)
			[19]

QUESTION/VRAAG 7

7.1		<p>✓ Shape (increasing to the left of A and the right of B./Vorm (neem toe links van A en regs van B)</p> <p>✓ A as Max. Tp and B as Min.Tp/A as Maks DP en B Min DP</p> <p>✓ Decreasing between A and B/Neem af tussen A en B</p> <p>✓ B above x-axis/B bo x-as above 2 on the yaxis</p>	
		<p><b>Minus 1 mark if turning points A and B not labelled/Minus 1 punt as draaipunte A en B nie benoem is nie</b></p>	(4)

7.2	$f(x) = x^3 + bx^2 + cx + d$ $f'(x) = 3x^2 + 2bx + c$ $f'(-1) = 3(-1)^2 + 2b(-1) + c = 0$ $\therefore 3 - 2b + c = 0 \quad (1)$ $f'(2) = 3(2)^2 + 2b(2) + c = 0$ $\therefore 12 + 4b + c = 0 \quad (2)$ $(1) - (2) : -9 - 6b = 0$ $\therefore b = -\frac{3}{2}$ $\therefore 3 + 3 + c = 0$ $\therefore c = -6$	<p>✓ derivative method and accuracy/<i>afgeleide metode en akkuraatheid</i></p> <p>✓ <math>f'(x) = 0</math> at/by <math>-1</math> and/en <math>2</math></p> <p>✓✓ deriving each equation/<i>afgeleide van elke vergelyking</i></p> <p>✓ value of <math>b</math>/<i>waarde van <math>b</math></i></p> <p>✓ value of <math>c</math>/<i>waarde van <math>c</math></i></p>	(6)
			<b>[10]</b>

**QUESTION/VRAAG 8**

8.1	$T(t) = 30 + 4t - \frac{1}{2}t^2, t \in [0; 10].$ $T'(t) = 4 - t$	<p>✓ 4</p> <p>✓ <math>-t</math></p>	(2)
8.2	$T'(t) \leq 0$ $4 - t \leq 0$ $t \geq 4$ $\therefore 4 \leq t \leq 10$	<p>✓ <math>T'(t) \leq 0</math></p> <p>✓ <math>4 - t \leq 0</math></p> <p>✓ <math>t</math>-subject of formula/<i>t die onderwerp van formule</i></p> <p>✓ answer/<i>antwoord</i>  <b>accept/aanvaar</b> <math>4 &lt; t \leq 10</math></p>	(4)
			<b>[6]</b>
<b>TOTAL/TOTAAL:</b>			<b>115</b>

Use the formula:  $\frac{a}{115} \times 100 = b$ . Then,  $\frac{b}{100} \times 150 = c$

$C$  is the mark that is entered into SASAMS **out of 150**.