



**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***

**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 | $12x = x^2$<br>$x^2 - 12x = 0$<br>$x(x - 12) = 0$<br>$x = 0$ or/of $x = 12$                                                                                                                                                                                                                         | ✓ std form/standaard vorm<br>✓ factors/faktore<br>✓ both answers correct/<br>beide antwoorde korrek                                                                                                                                                                                                                                                                                                                                 | (3) |
| 1.1.2 | Let $p^2 - 1 = x$<br>$\therefore p^2 - 1 = 0$ or/of $p^2 - 1 = 12$<br>$p^2 = 1$ $p^2 = 13$<br>$p \pm 1$ $p^2 \pm \sqrt{13}$<br><br><b>OR/OF</b><br><br>$p^4 - 2p^2 + 1 - 12p^2 + 12 = 0$<br>$p^4 - 14p^2 + 13 = 0$<br>$(p^2 - 1)(p^2 - 13) = 0$<br>$\therefore p = \pm 1$ or/of $p = \pm \sqrt{13}$ | ✓ subst./vervang $p^2 - 1 = x$<br>✓ values for/waardes van $p^2$<br><br>✓✓ roots/wortels<br><br><br>✓ expansion/uitbreiding<br><br>✓ factors/faktore<br>✓✓ roots/wortels                                                                                                                                                                                                                                                            | (4) |
| 1.2   | $5x^2 + 7x - 2 = 0$<br>$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$<br>$= \frac{- (7) \pm \sqrt{(7)^2 - 4(5)(-2)}}{2(5)}$<br>$= \frac{- (7) \pm \sqrt{89}}{10}$<br>$x = 0,24$ or/of $x = 1,64$                                                                                                          | <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <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> </div><br>✓ subst. into correct formula/<br>subt in die korrekte formule<br>✓ simplification<br>vereenvoudiging<br>✓✓ values of x<br>waardes van x | (4) |

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

QUESTION/VRAAG 2

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                  |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <p>2.1</p> | $S_n = k \left( 1 - \left( \frac{1}{2} \right)^n \right)$ $a = k \left( 1 - \left( \frac{1}{2} \right)^1 \right)$ $= \frac{k}{2}$ $r = \frac{1}{2}$ $\therefore 10 = \frac{\frac{k}{2}}{1 - \frac{1}{2}}$ $5 = \frac{k}{2}$ $\therefore k = 10$ <p><b>OR/OF</b></p> $\left( \frac{1}{2} \right)^n \rightarrow 0 \text{ as } n \rightarrow \infty$ $\therefore S_n = k$ $\therefore k = 10$ <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> |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|

|     |                                                                                                                                                                                                                                    |                                                                                                                                  |            |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------|
|     | $S_1 = \frac{k}{2}; \quad S_2 = \frac{k}{4}; \quad S_3 = \frac{k}{2}$ $S_\infty = \frac{a}{1-r} = 10$ $a = \frac{k}{2} \text{ and/en } k = \frac{1}{2}$ $1 = \frac{\frac{k}{2}}{\left(1 - \frac{1}{2}\right)}$ $\therefore k = 10$ | $\checkmark S_\infty = \frac{a}{1-r} = 10$ $\checkmark a = \frac{k}{2}$ $\checkmark r = \frac{1}{2}$ $\checkmark k = 10$         | (4)        |
| 2.2 | $r = \frac{1}{2}$ $\frac{a}{1 - \frac{1}{2}} = 10$ $a = 5$ $T_2 = ar = \frac{5}{2}$                                                                                                                                                | $\checkmark r = \frac{1}{2}$ $\checkmark \text{substitution/substitusie}$ $\checkmark a = 5$ $\checkmark \text{answer/antwoord}$ | (4)        |
|     |                                                                                                                                                                                                                                    |                                                                                                                                  | <b>[8]</b> |

**QUESTION/VRAAG 3**

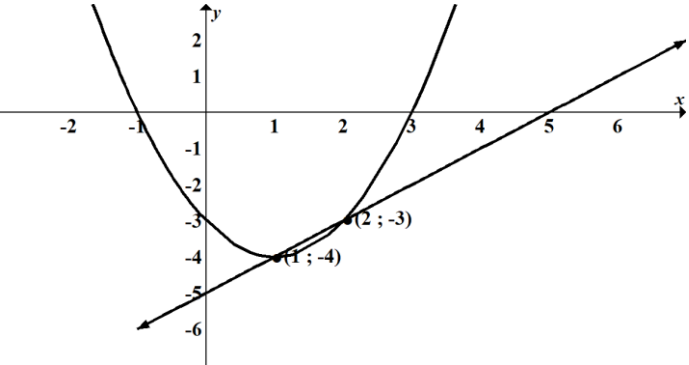
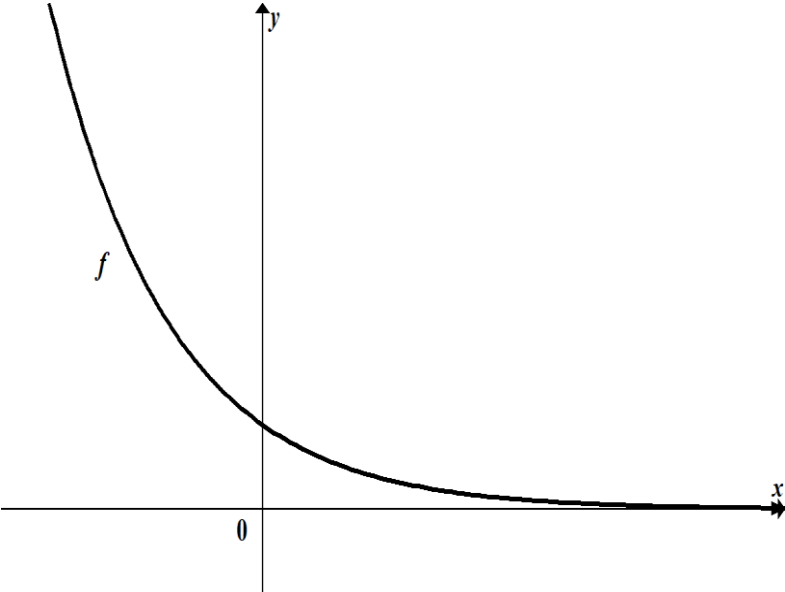
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                      |     |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 3.1 | $S_n = a + (a + d) + (a + 2d) + \dots + a + (n - 1)d \quad (1)$ $S_n = a + (n - 1)d + (a + (n - 2)d) + (a + (n - 3)d) + \dots + a \quad (2)$ $2S_n = n(2a + (n - 1)d)$ $S_n = \frac{n}{2}(2a + (n - 1)d)$                                                                                                                                                                                                                        | <p>✓ first series/<br/>eerste reeks</p> <p>✓ series reversed/<br/>omgekeerde reeks</p> <p>✓ sum of series/<br/>som van die reeks</p> <p>✓ dividing by 2/<br/>deel deur 2</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) |

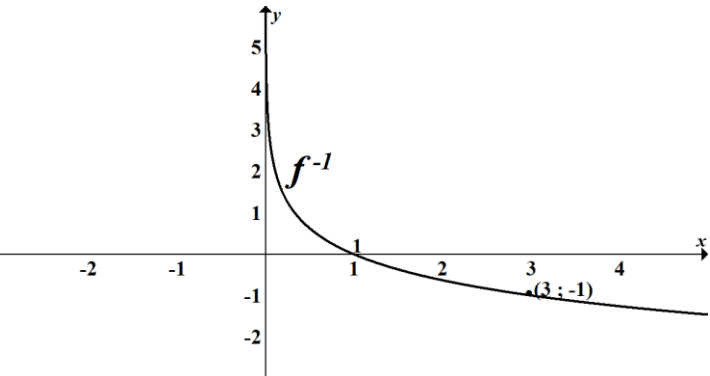
|     |       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                     |
|-----|-------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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<br>✓ $n = 69$<br>✓ answer/antwoord (3)                                                                                                                                  |
|     | 3.3.2 |     | $T_{89} - T_{69} = (T_{70} - T_{69}) + (T_{71} - T_{70}) + \dots + (T_{89} - T_{88})$ $= 415 + 421 + \dots \text{ to 20 terms/tot 20 terme}$ $= \frac{20}{2} [2(415) + 19(6)]$ $= 9440$ <p><math>\therefore T_{69} = T_{89} - (\text{sum of the differences from/som van die verskille van } T_{69} \text{ to } T_{89})</math></p> $\therefore T_{69} = 23594 - 9440$ $= 14154$ <p><b>OR/OF</b></p> $T_{n+1} - T_n = 7 + 6(n - 1)$ $\therefore T_{89} - T_1 = \sum_{n=1}^{88} (T_{n+1} - T_n)$ $= \frac{n}{2} [2a + (n - 1)d]$ $= \frac{88}{2} [14 + (87)6]$ $= 23584$ $\therefore T_1 = 23594 - 23584 = 10$ $\therefore T_{69} - 10 = \sum_{n=1}^{68} (T_{n+1} - T_n)$ $= 34(15 + (67)6)$ $= 14144$ $\therefore T_{69} = 14154$ <p><b>OR/OF</b></p> | ✓ expansion/ uitbreiding<br>✓ $n = 20$<br>✓ $a = 415$<br>✓ method/metode<br>✓ answer/antwoord (5)<br><b>OR/OF</b><br>✓ formula/formule<br>✓ value of $S_{88}$ / waarde van $S_{88}$<br>✓ $T_1 = 23594 - 23584 = 10$<br><b>OR/OF</b> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\begin{array}{cccc} 7 & 13 & 19 & 25 \\ & 6 & 6 & 6 \end{array}$ $\therefore 2a = 6$ $\therefore a = 3$ $7 - 6 = 1$ $T_1 - T_0 = 1$ $a + b + c - c = 1$ $3 + b = 1$ $b = -2$ $T_{89} = 3(89)^2 - 2(89) + c = 23594$ $\therefore c = 9$ $\therefore T_n = 3n^2 - 2n + 9$ $T_{69} = 3(69)^2 - 2(69) + 9$ $= 14154$ <p><b>OR/OF</b></p> $\begin{array}{cccc} 7 & 13 & 19 & 25 \\ & 6 & 6 & 6 \end{array}$ $\therefore 2a = 6$ $\therefore a = 3$ $3a + b = 7$ $b = -2$ $T_{89} = 3(89)^2 - 2(89) + c = 23594$ $\therefore c = 9$ $\therefore T_n = 3n^2 - 2n + 9$ $T_{69} = 3(69)^2 - 2(69) + 9$ $= 14154$ | <p>✓ substitution/substitusie</p> <p>✓ answer/antwoord (5)</p> <p><b>OR/OF</b></p> <p>✓ <math>a</math> and/en <math>b</math></p> <p>✓ <math>T_{89}</math> (subst. <math>n = 89</math>)</p> <p>✓ <math>T_n = 3n^2 - 2n + 9</math></p> <p>✓ <math>T_{89}</math> (subst./vervang <math>n = 69</math>)</p> <p>✓ answer/antwoord (5)</p> <p><b>OR/OF</b></p> <p>✓ substitution/substitusie</p> <p>✓ answer/antwoord</p> <p>✓ <math>a</math> and/en <math>b</math></p> <p>✓ <math>T_{89}</math> (subst./vervang <math>n = 89</math>)</p> <p>✓ <math>T_n = 3n^2 - 2n + 9</math></p> <p>✓ <math>T_{69}</math> (subst./vervang <math>n = 69</math>)</p> <p>✓ answer/antwoord (5)</p> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>[17]</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**QUESTION/VRAAG 4**

|     |                                                          |                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                      |     |
|-----|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 4.1 | Given/Gegee: $f(x) = x^2 - 2x - 3$ and/en $g(x) = x - 5$ |                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                      |     |
|     |                                                          |                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                      |     |
|     | 4.1.1                                                    | $f(x) = x^2 - 2x - 3$<br>$x = \frac{-b}{2a}$ and/en $y = \frac{4ac - b^2}{4a}$<br>$x = \frac{-(-2)}{2(1)}$ $y = \frac{4(1)(-3) - (-2)^2}{4(1)}$<br>$x = 1$ $y = -4$<br>$\therefore TP$ is $(1; -4)$<br><br><b>OR/OF</b><br><br>$f'(x) = 0$ $f(1) = (1)^2 - 2(1) - 3$<br>$f'(x) = 2x - 2$ $= 1 - 2 - 3$<br>$\therefore 2x - 2 = 0$ $f(1) = -4$<br>$x = 1$<br>$\therefore TP$ is $(1; -4)$ | <div>✓ formula (axis of symmetry)/Formule (simmetrie-as)</div> <div>✓ substitution/substitusie</div> <div>✓ subst. into y-formula/ substitusie in y-formule</div><br><b>OR/OF</b> <div>✓ <math>f'(x) = 0</math></div> <div>✓ derivative/afgeleide</div> <div>✓ subst. x-values</div> | (3) |
|     |                                                          |                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                      |     |
|     | 4.1.2                                                    | $f(x) = x^2 - 2x - 3$<br>$(x + 1)(x - 3) = 0$ $y = (0)^2 - 2(0) - 3 = -3$<br>$x = -1$ and/en $x = 3$<br>$\therefore (0; -3) \rightarrow$ coordinate of the y-intercept/<br><i>koördinate van die y-afsnit</i><br>are the coordinates of the x-intercept/is die<br><i>koördinate van die x-afsnit</i><br>$\therefore (-1; 0)$ and/en $(3; 0)$                                             | <div>✓ factors/faktore</div> <div>✓ both x-values/beide x waardes</div> <div>✓ y-value/y-waarde</div>                                                                                                                                                                                | (3) |
|     |                                                          |                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                      |     |
|     | 4.1.3                                                    | $x - 5 = x^2 - 2x - 3$<br>$x^2 - 3x + 2 = 0$<br>$(x - 1)(x - 2) = 0$<br>$x = 1$ or/of $x = 2$<br>$y = -4$ or/of $y = -3$<br>$\therefore (1; -4)$ or/of $(2; -3)$<br>are the points of intersection/is die snypunte                                                                                                                                                                       | <div>✓ std form/standaard vorm</div> <div>✓ factors/faktore</div> <div>✓ both x-values/beide x-waardes</div> <div>✓ both y-values/beide y-waardes</div>                                                                                                                              | (4) |

|       |                                                                                     |                                                                                                                                                                                                                         |     |
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| 4.1.4 |    | $f(x) = x^2 - 2x - 3 :$<br>✓ y-intercept/afsnit<br>✓ x-intercept/afsnit<br>✓ turning point/draaipunt<br>✓ $(2; -3)$ on the graph/<br>op die grafiek<br>$g(x) = x - 5 :$<br>✓ y-intercept/afsnit<br>✓ x-intercept/afsnit | (6) |
| 4.1.5 | $x \leq -1$ or $x \geq 3$                                                           | ✓ roots/wortel ✓ inequality<br>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> $x = \left(\frac{1}{3}\right)^y \quad -y = \log_3 x$ $x = 3^{-y} \quad y = -\log_3 x$                                                                                                                                                        | <p>✓ swapping x- and y-values<br/>ruil die x- en y-waardes</p> <p>✓ answer/antwoord</p> <p><b>OR/OF</b></p> <p>✓ swapping x- and y-values<br/>ruil die x- en y-waardes</p> <p>✓ answer/antwoord</p> | <p>(2)</p> <p>(2)</p> |
| 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>(3)</p>            |
| 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/<br/>subt. in die LK</p> <p>✓ subst. into RHS/<br/>subt. in die RK</p> <p>✓ <math>3^{-2x} - 3^{2x}</math></p>                                                                  | <p>(3)</p>            |
| <b>[29]</b> |                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                     |                       |

**QUESTION/VRAAG 5**

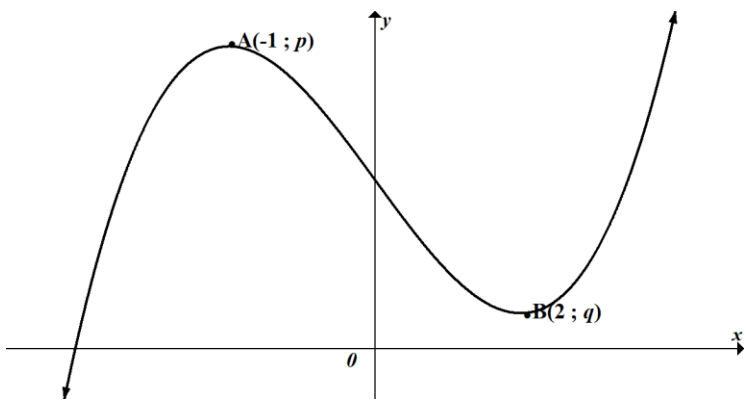
|     |                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                 |     |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|     | $f(x) = \frac{a}{x-p} + q$                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                 |     |
| 5.1 | $p = 4$<br>$q = 2$<br>$3 = \frac{a}{5-4} + 2$<br>$1 = \frac{a}{1}$<br>$\therefore a = 1$                                                                                                                                                                                                                                       | $\checkmark p = 4$<br>$\checkmark q = 2$<br>$\checkmark$ subst. of/van $T(5;3)$<br>$\checkmark a = 1$                                                                           | (4) |
| 5.2 | $y = -x + 2$<br>substitute/vervang $(4; 2)$<br>$2 = -4 + c$<br>$c = 6$<br><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<br>$y = -(x-4) + 2$<br>$y = -x + 6$<br>$\therefore c = 6$ | $\checkmark$ subst. of/van $T(4;2)$<br>$\checkmark c = 6$<br><p style="text-align: center;"><b>OR/OF</b></p> $\checkmark$ subst. of/van $x - 4$<br>$\checkmark$ answer/antwoord | (2) |
|     |                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                 | [6] |

QUESTION/VRAAG 6

|     |                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                      |     |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 6.1 | $3x - x^2$<br>$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}, h \neq 0$<br>$= \lim_{h \rightarrow 0} \frac{3(x+h) - (x+h)^2 - (3x - x^2)}{h}$<br>$= \lim_{h \rightarrow 0} \frac{3x + 3h - x^2 - 2xh - h^2 - 3x + x^2}{h}$<br>$= \lim_{h \rightarrow 0} \frac{3h - 2xh - h^2}{h}$<br>$= \lim_{h \rightarrow 0} \frac{h(3 - 2x - h)}{h}$<br>$= \lim_{h \rightarrow 0} (3 - 2x - h)$<br>$f'(x) = 3 - 2x$ | <p>✓ substitution into correct formula/substitusie in die korrekte formule</p> <p>✓ simplification/vereenvoudiging</p> <p>✓ factorization/faktorisering</p> <p>✓ answer/antwoord</p> | (4) |
| 6.2 | <p>6.2.1</p> $y = \frac{x - 3\sqrt{x}}{x^2}$<br>$y = \frac{x - 3x^{\frac{1}{2}}}{x^2}$<br>$y = x^{-1} - 3x^{-\frac{3}{2}}$<br>$\frac{dy}{dx} = -x^{-2} + \frac{9}{2}x^{-\frac{5}{2}}$                                                                                                                                                                                                                           | <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) |
|     | <p>6.2.2</p> $\frac{y}{3x} = (1+x)^2$<br>$\frac{y}{3x} = 1 + 2x + x^2$<br>$y = 3x + 6x^2 + 3x^3$<br>$\frac{dy}{dx} = 3 + 12x + 9x^2$                                                                                                                                                                                                                                                                            | <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 <math>(2; 12) : 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><math>(1) + (2) : 24a = 24</math></p> <p>Subst. into/vervang in <math>(1) : 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)         |
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                        | <b>[19]</b> |

**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</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <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> </div> | (4) |
|-----|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|

|     |                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                        |             |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 7.2 | $f(x) = x^3 + bx^2 + cx + d$<br>$f'(x) = 3x^2 + 2bx + c$<br>$f'(-1) = 3(-1)^2 + 2b(-1) + c = 0$<br>$\therefore 3 - 2b + c = 0 \quad (1)$<br>$f'(2) = 3(2)^2 + 2b(2) + c = 0$<br>$\therefore 12 + 4b + c = 0 \quad (2)$<br>$(1) - (2) : -9 - 6b = 0$<br>$\therefore b = -\frac{3}{2}$<br>$\therefore 3 + 3 + c = 0$<br>$\therefore c = -6$ | <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                  | $T(t) = 30 + 4t - \frac{1}{2}t^2, t \in [0; 10].$<br>$T'(t) = 4 - t$            | <p>✓ 4</p> <p>✓ <math>-t</math></p>                                                                                                                                                                                              | (2)        |
| 8.2                  | $T'(t) \leq 0$<br>$4 - t \leq 0$<br>$t \geq 4$<br>$\therefore 4 \leq t \leq 10$ | <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 accept/aanvaar</i> <math>4 &lt; t \leq 10</math></p> | (4)        |
|                      |                                                                                 |                                                                                                                                                                                                                                  | <b>[6]</b> |
|                      |                                                                                 |                                                                                                                                                                                                                                  |            |
| <b>TOTAL/TOTAAL:</b> |                                                                                 |                                                                                                                                                                                                                                  | <b>120</b> |