



**basic education**

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE  
NASIONALE  
SENIOR SERTIFIKAAT**

**GRADE 12/GRAAD 12**

**TECHNICAL MATHEMATICS P1/TEGNIJSE WISKUNDE V1**

**NOVEMBER 2024**

**MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

| <b>MARKING CODES/NASIENKODES</b> |                                                                          |
|----------------------------------|--------------------------------------------------------------------------|
| <b>A</b>                         | Accuracy/Akkuraatheid                                                    |
| <b>CA</b>                        | Consistent accuracy/Volgehoe akkuraatheid                                |
| <b>M</b>                         | Method/Metode                                                            |
| <b>R</b>                         | Rounding/Afronding                                                       |
| <b>NPR</b>                       | No penalty for rounding/Geen penalisering vir afronding nie              |
| <b>NPU</b>                       | No penalty for units omitted/Geen penalisering vir eenhede weggelaat nie |
| <b>S</b>                         | Simplification/Vereenvoudiging                                           |
| <b>SF</b>                        | Substitution in correct formula/Vervanging in korrekte formule           |

**These marking guidelines consist of 19 pages.  
Hierdie nasienriglyne bestaan uit 19 bladsye.**

**NOTE:**

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy (CA) applies in all aspects of the marking guidelines where indicated.
- No penalty for rounding (NPR) for ALL questions.
- # Shows questions where a Tolerance Range will be applied:  
**Q 2.2 ; Q 4.1.5 ; Q 5.4 & Q 9.2.2**

**LET WEL:**

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.
- Volgehoue akkuraatheid (CA) is deurgaans op alle aspekte van die nasienriglyne van toepassing soos aangedui.
- Geen penalisering vir afronding (NPR) vir ALLE vrae nie.
- # Toon vrae waar Toleransie wydte ( Verdraagsaamheids-omvang) toegepas word: **V 2.2 ; V 4.1.5 ; V 5.4 & V 9.2.2**

**QUESTION/VRAAG 1**

|       |                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                         |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.1.1 | $x(2x + 7) = 0$<br><br>$x = 0$ or / of $-\frac{7}{2}$ <b>OR OF</b> $x = -3,5$                                                                                                                                                                                                                                                                                                                                             | $\checkmark 0$ <b>A</b><br>$\checkmark -\frac{7}{2}$ <b>OR/OF</b> $-3,5$ <b>A</b><br><b>(2)</b>                                                                                         |
| 1.1.2 | $3x^2 + x = 6 + 5x$<br><br>$3x^2 - 4x - 6 = 0$ <b>OR/OF</b> $0 = -3x^2 + 4x + 6$<br><br>$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$<br><br>$= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-6)}}{2(3)}$ <b>OR/OF</b> $= \frac{-(4) \pm \sqrt{(4)^2 - 4(-3)(6)}}{2(-3)}$<br><br>$= \frac{4 \pm \sqrt{88}}{6}$<br><br>$\therefore x \approx 2,23$ or / of $x \approx -0,90$<br><br><b>Refer to the Addendum/ Verwys na die Addendum</b> | $\checkmark$ std form/vorm <b>A</b><br><br>$\checkmark$ SF <b>CA</b><br><br>$\checkmark x \approx 2,23$ <b>CA</b><br>$\checkmark x \approx -0,90$ <b>CA</b><br><b>NPR</b><br><b>(4)</b> |

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                           |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.1.3 | <p><math>x^2 + 3x - 10 \leq 0</math></p> <p><math>(x - 2)(x + 5) \leq 0</math>      <b>OR/OF</b>      <math>\frac{-(3) \pm \sqrt{(3)^2 - 4(1)(-10)}}{2(1)}</math></p> <p>Critical values/Kritieke waardes: 2 and/en -5</p> <p><math>\therefore -5 \leq x \leq 2</math> <b>OR/OF</b> <math>x \in [-5; 2]</math> <b>OR/OF</b> <math>x \geq -5</math> and/en <math>x \leq 2</math></p> <p style="text-align: center;"><b>OR/OF</b></p> <div style="text-align: center;">  </div> <p style="text-align: center;"><b>OR/OF</b></p> <p>Accept: From -5 to 2 / Aanvaar: Vanaf -5 tot 2</p> | <p>✓ factors/faktore/SF    <b>A</b></p> <p>✓ both critical values/<br/>kritieke waardes    <b>CA</b></p> <p>✓ correct notation/<br/>korrekte notasie/<br/>correct graphical<br/>solution/korrekte<br/>grafiese oplossing    <b>A</b></p> <p><b>AO: Full Marks/<br/>Volpunte</b></p> <p style="text-align: right;">(3)</p> |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.2 | $y - x = 2$ and/en $x^2 + y^2 = 20$<br>$x = y - 2$<br>$(y - 2)^2 + y^2 = 20$<br>$y^2 - 4y + 4 + y^2 = 20$<br>$2y^2 - 4y - 16 = 0$<br>$2(y - 4)(y + 2) = 0$ <b>OR/OF</b> $y = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(-16)}}{2(2)}$<br>$\therefore y = 4$ or/of $y = -2$<br>$\therefore x = 4 - 2 = 2$ or/of $x = -2 - 2 = -4$<br><p style="text-align: center;"><b>OR/OF</b></p> $y = x + 2$<br>$x^2 + (x + 2)^2 = 20$<br>$x^2 + x^2 + 4x + 4 = 20$<br>$2x^2 + 4x - 16 = 0$<br>$2(x - 2)(x + 4) = 0$ <b>OR/OF</b> $x = \frac{-(4) \pm \sqrt{(4)^2 - 4(2)(-16)}}{2(2)}$<br>$\therefore x = 2$ or/of $x = -4$<br>$\therefore y = 2 + 2 = 4$ or/of $y = -4 + 2 = -2$<br><b>Refer to the Addendum/ Verwys na die Addendum</b> | $\checkmark$ subject/onderwerp <b>A</b><br>$\checkmark$ subst./vervang <b>CA</b><br>$\checkmark$ std form/vorm <b>CA</b><br>$\checkmark$ Factors/Faktore/SF <b>CA</b><br>$\checkmark$ both y-values/beide y-wrdes <b>CA</b><br>$\checkmark$ both x-values/beide x-wrdes <b>CA</b><br><p style="text-align: center;"><b>OR/OF</b></p> $\checkmark$ subject/onderwerp <b>A</b><br>$\checkmark$ subst./vervang <b>CA</b><br>$\checkmark$ std form/vorm <b>CA</b><br>$\checkmark$ Factors/Faktore/SF <b>CA</b><br>$\checkmark$ both x-values/beide x-wrdes <b>CA</b><br>$\checkmark$ both y-values/beide y-wrdes <b>CA</b><br><b>(6)</b> |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.3.1 | $CR = \frac{CV + SV}{SV}$ $SV \times CR = CV + SV$ $CV = SV \times CR - SV \quad \text{OR/OF} \quad CV = SV \times (CR - 1)$ <p style="text-align: center;"><b>OR/OF</b></p> $CR = \frac{CV}{SV} + \frac{SV}{SV}$ $CR = \frac{CV}{SV} + 1$ $CV = SV \times (CR - 1)$                                                                                                                                                              | <p>✓ multiplying by SV/<br/>vermenigvuldiging met SV <b>A</b></p> <p>✓ CV subject/onderwerp <b>CA</b></p> <p style="text-align: center;"><b>OR/OF</b></p> <p>✓ dividing/ verdeling <b>A</b></p> <p>✓ CV subject/ onderwerp <b>CA</b></p> <p style="text-align: right;">(2)</p> |
| 1.3.2 | $CV = SV \times CR - SV$ $= 48 \text{ cm}^3 \times \frac{9,5}{1} - 48 \text{ cm}^3$ $= 408 \text{ cm}^3$ <p style="text-align: center;"><b>OR/OF</b></p> $CV = SV (CR - 1)$ $= 48 \text{ cm}^3 \left( \frac{9,5}{1} - 1 \right)$ $= 408 \text{ cm}^3$ <p style="text-align: center;"><b>OR/OF</b></p> $CR = \frac{CV + SV}{SV}$ $\frac{9,5}{1} = \frac{CV + 48 \text{ cm}^3}{48 \text{ cm}^3}$ $\therefore CV = 408 \text{ cm}^3$ | <p>✓ SF <b>CA</b></p> <p>✓ S <b>CA</b></p> <p style="text-align: center;"><b>OR/OF</b></p> <p>✓ SF <b>CA</b></p> <p>✓ S <b>CA</b></p> <p style="text-align: center;"><b>OR/OF</b></p> <p>✓ SF <b>A</b></p> <p>✓ S<br/>NPU <b>CA</b></p> <p style="text-align: right;">(2)</p>  |

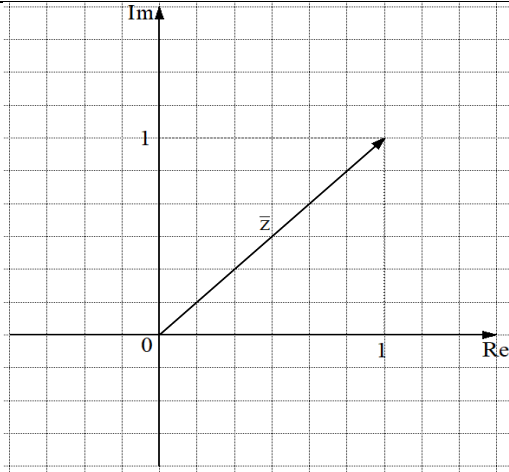
|     |                                                                                                                                                                                                                     |                                                                                                                                              |                                                                |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| 1.4 | $1110_2 = 14$                                                                                                                                                                                                       | ✓14                                                                                                                                          | <b>A</b><br>(1)                                                |
| 1.5 | $1110_2 \times 35$<br>$= 14 \times 35 = 490 = 111101010_2$<br><p style="text-align: center;"><b>OR/OF</b></p> $1110_2 \times 100011_2 = 111101010_2$<br><p><b>Refer to the Addendum /Verwys na die Addendum</b></p> | ✓490<br>✓ $111101010_2$<br><p style="text-align: center;"><b>OR/OF</b></p> ✓ $100011_2$<br>✓ $111101010_2$<br><b>AO: Full marks/Volpunte</b> | <b>CA</b><br><b>CA</b><br><br><b>A</b><br><b>CA</b><br><br>(2) |
|     |                                                                                                                                                                                                                     |                                                                                                                                              | [22]                                                           |

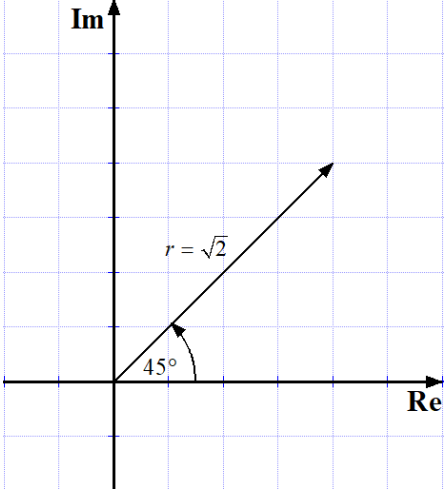
**QUESTION/VRAAG 2**

|       |                                                                                                                                                                                                                                                                  |                                                                                                                                                                   |                                  |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| 2.1.1 | $p = 3$                                                                                                                                                                                                                                                          | ✓ 3                                                                                                                                                               | <b>A</b><br>(1)                  |
| 2.1.2 | $1 - 7p < 0$<br>$p > \frac{1}{7}$ <b>OR/OF</b> $p > 0,14$                                                                                                                                                                                                        | ✓ $\Delta < 0$<br>✓ $p > \frac{1}{7}$ <b>OR/OF</b> $p > 0,14$<br><b>AO: Full marks/Volpunte</b>                                                                   | <b>A</b><br><b>CA</b><br><br>(2) |
| 2.2   | $3(x + 1) = x^2 + t$<br>$x^2 - 3x - 3 + t = 0$ <b>OR/OF</b> $-x^2 + 3x + 3 - t = 0$<br>$(-3)^2 - 4(1)(-3 + t) \geq 0$ <b>OR/OF</b> $(3)^2 - 4(-1)(3 - t) \geq 0$<br>$9 + 12 - 4t \geq 0$<br>$-4t \geq -21$<br>$\therefore t \leq \frac{21}{4}$ <b>OR/OF</b> 5,25 | ✓ standard form / <i>standaardvorm</i> <b>A</b><br><br>✓ <b>SF</b> <b>CA</b><br>✓ $\Delta \geq 0$ <b>A</b><br><br>✓ value(s) of/ <i>waardes van</i> $t$ <b>CA</b> | <br><br><br><br><br><br>(4)      |
|       |                                                                                                                                                                                                                                                                  |                                                                                                                                                                   | [7]                              |

**QUESTION/VRAAG 3**

|       |                                                                                                                                                                                                                                                                                                                             |                                                                                                                 |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| 3.1.1 | $27^{\frac{2}{3}} = 9$ <b>OR/OF</b> $3^2$                                                                                                                                                                                                                                                                                   | ✓ 9 <b>OR/OF</b> $3^2$<br><b>A</b><br>(1)                                                                       |
| 3.1.2 | $(1 + \sqrt{3})^2 - \sqrt{12}$<br>$= 1 + 2\sqrt{3} + 3 - 2\sqrt{3}$<br>$= 4$<br><b>Refer to the Addendum/ Verwys na die Addendum</b>                                                                                                                                                                                        | ✓ expanding/ uitbreiding <b>A</b><br>✓ $2\sqrt{3}$ <b>A</b><br>✓ S <b>CA</b><br><b>AO : 1 mark/ punt</b><br>(3) |
| 3.1.3 | $\log_p p = 1$                                                                                                                                                                                                                                                                                                              | ✓ 1 <b>A</b><br>(1)                                                                                             |
| 3.1.4 | $\log_3 81 - \log_2 \sin 30^\circ - \log_5 \sqrt{5}$<br>$= \log_3 3^4 - \log_2 \frac{1}{2} - \log_5 5^{\frac{1}{2}}$ <b>OR/OF</b> $= \frac{\log 3^4}{\log 3} - \frac{\log 2^{-1}}{\log 2} - \frac{\log 5^{\frac{1}{2}}}{\log 5}$<br>$= 4 + 1 - \frac{1}{2}$<br>$= 4\frac{1}{2}$ <b>OR/OF</b> $\frac{9}{2}$ <b>OR/OF</b> 4,5 | ✓ 4 <b>A</b><br>✓ + 1 <b>A</b><br>✓ $-\frac{1}{2}$ <b>A</b><br>✓ S <b>CA</b><br><b>AO : 1 mark/ punt</b><br>(4) |

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                         |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.2   | $5^{x+2} - 5^x = \frac{24}{5}$ $5^x \times 5^2 - 5^x = \frac{24}{5} \quad \text{OR/OF} \quad 5^x \times 25 - 5^x = \frac{24}{5}$ $5^x (5^2 - 1) = \frac{24}{5} \quad \text{OR/OF} \quad 5^x (24) = \frac{24}{5}$ $5^x = \frac{1}{5} = 5^{-1}$ $\therefore x = -1$ <p style="text-align: center;"><b>OR/OF</b></p> $5^{x+2} - 5^x = \frac{24}{5}$ $5^{x+3} - 5^{x+1} = 24$ $5^x \times 5^3 - 5^x \times 5^1 = 24 \quad \text{OR/OF} \quad 5^x \times 125 - 5^x \times 5 = 24$ $5^x (5^3 - 5) = 24 \quad \text{OR/OF} \quad 5^x (120) = 24$ $5^x = \frac{1}{5} = 5^{-1}$ $\therefore x = -1$ | <p>✓ exp.prop./eksp.einsk. <b>A</b></p> <p>✓ S <b>CA</b></p> <p>✓ value of/waarde van x <b>CA</b></p> <p style="text-align: center;"><b>OR/OF</b></p> <p>✓ exp.prop./eksp.einsk. <b>A</b></p> <p>✓ S <b>CA</b></p> <p>✓ value of/waarde van x <b>CA</b></p> <p><b>AO: Full marks/Volpunte</b></p> <p style="text-align: right;">(3)</p> |
| 3.3.1 | $z_1 = 1 - i$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>✓ form/vorm <b>A</b></p> <p style="text-align: right;">(1)</p>                                                                                                                                                                                                                                                                       |
| 3.3.2 | $\bar{z}_1 = 1 + i$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>✓ conjugate/konjugeerde <b>CA</b></p> <p style="text-align: right;">(1)</p>                                                                                                                                                                                                                                                          |
| 3.3.3 |  <p style="text-align: center;"><b>OR/OF</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>✓ Real part/Reële deel <b>CA</b></p> <p>✓ Imaginary part/ Imaginêre deel <b>CA</b></p> <p>✓ terminal arm or point where Re and Im intersect/terminale arm of punt waar Re en Im sny <b>CA</b></p> <p style="text-align: center;"><b>OR/OF</b></p>                                                                                    |

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ✓ Modulus/ <i>Modulus</i> <b>CA</b><br><br>✓✓ Argument/ <i>Argument</i> <b>CA</b><br><br>(3)                                                                                                                                                                                                                                                                                                                                          |
| 3.3.4 | $r = \sqrt{1^2 + (-1)^2}$ $= \sqrt{2} \text{ OR/OF } \approx 1,41$ $\text{ref./verwys } \angle = \tan^{-1}\left(\frac{1}{1}\right)$ $\text{ref./verwys } \angle = 45^\circ$ $\therefore \theta = 360^\circ - 45^\circ = 315^\circ$ $\therefore z_1 = \sqrt{2} \text{ cis } 315^\circ \text{ OR/OF } z_1 \approx 1,41 \text{ cis } 315^\circ$ <p style="text-align: center;"><b>OR/OF</b></p> $r = \sqrt{1^2 + (-1)^2}$ $= \sqrt{2} \text{ OR/OF } \approx 1,41$ $\theta = \tan^{-1}\left(-\frac{1}{1}\right)$ $\theta = -45^\circ$ $\therefore z_1 = \sqrt{2} \text{ cis } (-45^\circ) \text{ OR/OF } \therefore z_1 = 1,41 \text{ cis } (-45^\circ)$ | ✓SF <b>CA</b><br><br>✓ <i>r</i> <b>CA</b><br><br>✓ref./verwys $\angle$ <b>CA</b><br>✓correct quadrant / <i>korrekte kwadrant</i> <b>CA</b><br>✓polar form / <i>polêre vorm</i> <b>CA</b><br><br><p style="text-align: center;"><b>OR/OF</b></p> ✓SF <b>CA</b><br><br>✓ <i>r</i> <b>CA</b><br><br>✓✓ $-45^\circ$ <b>CA</b><br>✓correct polar form / <i>korrekte polêre vorm</i> <b>CA</b><br><br><b>AO: Full marks/Volpunte</b><br>(5) |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | [22]                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**QUESTION 4/VRAAG 4**

|       |                                                                                                                |                                                                       |                                     |
|-------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------|
| 4.1.1 |                                                                                                                | ✓ equation / vergelyking                                              | <b>A</b><br>(1)                     |
| 4.1.2 | <b>OR/OF</b><br><b>OR/OF</b><br><br><b>OR/OF</b><br><br>Accept: From $-5$ to $5$ / Aanvaar: Vanaf $-5$ tot $5$ | ✓ critical values / kritieke waardes<br>✓ notation / notasie          | <b>A</b><br><b>A</b><br><br><br>(2) |
| 4.1.3 | Accept/Aanvaar:                                                                                                | ✓ subst / vervang. $y = 0$<br><br>✓<br><b>AO: Full marks/Volpunte</b> | <b>A</b><br><br><br>(2)             |
| 4.1.4 | Accept/Aanvaar:                                                                                                | ✓ subst. / vervang $x = 0$<br>✓<br><b>AO: Full marks/Volpunte</b>     | <b>A</b><br><b>CA</b><br><br>(2)    |
| 4.1.5 |                                                                                                                |                                                                       |                                     |

For/vir  $h$ :

✓ shape / vorm

✓ all intercepts on axes / alle afsnitte op die asse

**A****A**For/ vir  $f$ :

✓ shape / vorm

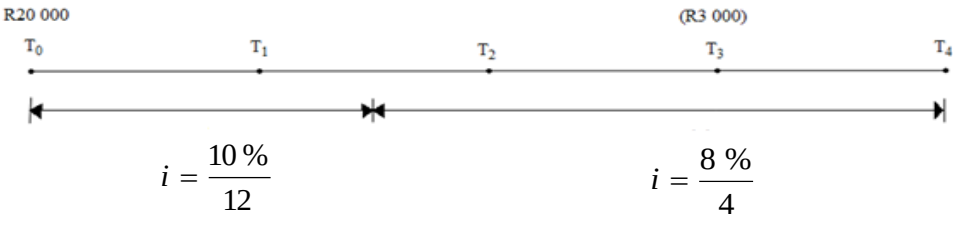
✓ asymptote / asimptoot

✓ intercept(s) /

**A****CA**





|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| 5.4 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|     | $A = 20\,000 \left(1 + \frac{10\%}{12}\right)^{1,5 \times 12} \approx R\,23\,222,25$ $\approx 23\,222,25 \left(1 + \frac{8\%}{4}\right)^{1,5 \times 4} \approx R\,26\,152,03$ $\therefore 26\,152,03 - 3\,000$ $\approx R\,23\,152,03$ $\approx 23\,152,03 \left(1 + \frac{8\%}{4}\right)^{1 \times 4}$ $\approx R\,25\,060,49$ <p style="text-align: center;"><b>OR/OF</b></p> $A = 20\,000 \left(1 + \frac{10\%}{12}\right)^{1,5 \times 12} \left(1 + \frac{8\%}{4}\right)^{2,5 \times 4}$ $- 3\,000 \left(1 + \frac{8\%}{4}\right)^{1 \times 4}$ $\approx R\,25\,060,49$ <p style="text-align: center;"><b>OR/OF</b></p> $A = \left[ 20\,000 \left(1 + \frac{10\%}{12}\right)^{1,5 \times 12} \left(1 + \frac{8\%}{4}\right)^{1,5 \times 4} - 3\,000 \right]$ $\times \left(1 + \frac{8\%}{4}\right)^{1 \times 4}$ $\approx R\,25\,060,49$ | $\checkmark 20\,000 \left(1 + \frac{10\%}{12}\right)^{1,5 \times 12} \quad \mathbf{A}$ $\checkmark 23\,222,25 \left(1 + \frac{8\%}{4}\right)^{1,5 \times 4} \quad \mathbf{CA}$ $\checkmark \mathbf{M} \quad \mathbf{A}$ $\checkmark 23\,152,03 \left(1 + \frac{8\%}{4}\right)^{1 \times 4} \quad \mathbf{CA}$ $\checkmark \approx R\,25\,060,49 \quad \mathbf{CA}$ <p style="text-align: center;"><b>OR/OF</b></p> $\checkmark 20\,000 \left(1 + \frac{10\%}{12}\right)^{1,5 \times 12} \quad \mathbf{A}$ $\checkmark \left(1 + \frac{8\%}{4}\right)^{2,5 \times 4} \quad \mathbf{A}$ $\checkmark \mathbf{M} \quad \mathbf{A}$ $\checkmark \left(1 + \frac{8\%}{4}\right)^{1 \times 4} \quad \mathbf{A}$ $\checkmark \approx R\,25\,060,49 \quad \mathbf{CA}$ <p style="text-align: center;"><b>OR/OF</b></p> $\checkmark 20\,000 \left(1 + \frac{10\%}{12}\right)^{1,5 \times 12} \quad \mathbf{A}$ $\checkmark \left(1 + \frac{8\%}{4}\right)^{1,5 \times 4} \quad \mathbf{A}$ $\checkmark \mathbf{M} \quad \mathbf{A}$ $\checkmark \left(1 + \frac{8\%}{4}\right)^{1 \times 4} \quad \mathbf{A}$ $\checkmark \approx R\,25\,060,49 \quad \mathbf{CA}$ <p style="text-align: right;">(5)</p> |
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | [17]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

**QUESTION/VRAAG 6**

|       |                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                          |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.1   | $f(x) = 9x - 6$<br>$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$<br>$= \lim_{h \rightarrow 0} \frac{9(x+h) - 6 - (9x - 6)}{h}$<br>$= \lim_{h \rightarrow 0} \frac{9x + 9h - 6 - 9x + 6}{h}$<br>$= \lim_{h \rightarrow 0} \frac{9h}{h}$<br>$= \lim_{h \rightarrow 0} (9)$<br>$\therefore f'(x) = 9$ | ✓ definition/definisie <b>A</b><br>✓ SF <b>A</b><br>✓ S <b>CA</b><br>✓ S <b>CA</b><br>✓ 9 <b>CA</b><br><b>Penalty: 1 mark for incorrect notation/</b><br><b>Penaliseer : 1 punt vir foutiewe notasie</b><br><b>AO: 1mark/punt</b><br>(5) |
| 6.2   | $f(x) = 11\pi^2$<br>$f'(x) = 0$                                                                                                                                                                                                                                                                               | ✓ 0 <b>A</b><br>(1)                                                                                                                                                                                                                      |
| 6.3.1 | $y = x \left( 3 + \frac{3}{x^5} \right)$<br>$= 3x + 3x^{-4}$                                                                                                                                                                                                                                                  | ✓ $3x$ <b>A</b><br>✓ $3x^{-4}$ or/of $\frac{3}{x^4}$ <b>A</b><br>(2)                                                                                                                                                                     |
| 6.3.2 | $\frac{dy}{dx} = 3 - 12x^{-5}$                                                                                                                                                                                                                                                                                | ✓ 3 <b>CA</b><br>✓ $-12x^{-5}$ or/of $-\frac{12}{x^5}$ <b>CA</b><br>(2)                                                                                                                                                                  |
| 6.4.1 | $\sqrt[5]{x^8} = x^{\frac{8}{5}}$                                                                                                                                                                                                                                                                             | ✓ $x^{\frac{8}{5}}$ <b>A</b><br>(1)                                                                                                                                                                                                      |
| 6.4.2 | $D_x \left[ x^{\frac{8}{5}} - 5x^{12} \right]$<br>$= \frac{8}{5} x^{\frac{3}{5}} - 60x^{11}$                                                                                                                                                                                                                  | ✓ $\frac{8}{5} x^{\frac{3}{5}}$ <b>CA</b><br>✓ $-60x^{11}$ <b>A</b><br>(2)                                                                                                                                                               |

|       |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                               |                                                                            |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 6.5.1 | $g(x) = -x^3 + 6x^2$<br>$g'(x) = -3x^2 + 12x$                                                                                                                                                                                                                     | ✓ $-3x^2$<br>✓ $12x$                                                                                                                                                                          | <b>A</b><br><b>A</b><br><b>(2)</b>                                         |
| 6.5.2 | $g'(-2) = -3(-2)^2 + 12(-2)$<br><br>$= -36$                                                                                                                                                                                                                       | ✓ Sub. into derivative / vervang in afgeleide<br>✓ $-36$<br><b>AO: Full marks/Volpunte</b>                                                                                                    | <b>CA</b><br><b>CA</b><br><b>(2)</b>                                       |
| 6.5.3 | $-3x^2 + 12x = -36$<br>$-3x^2 + 12x + 36 = 0$<br>$-3(x-6)(x+2) = 0$ <b>OR/OF</b> $x = \frac{-(12) \pm \sqrt{(12)^2 - 4(-3)(36)}}{2(-3)}$<br><br>$\therefore x = 6$<br><br>$y = g(6) = -(6)^3 + 6(6)^2 = 0$<br><br>The other point is /Die ander punt is $(6 ; 0)$ | ✓ equating / gelykstelling<br>✓ factors/formula/faktore<br><br>✓ x-coordinate of other point / x-koördinaat van ander punt<br><br>✓ y-coordinate of other point / y-koördinaat van ander punt | <b>CA</b><br><b>CA</b><br><br><b>CA</b><br><br><b>CA</b><br><br><b>(4)</b> |
|       |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                               | <b>[21]</b>                                                                |

**QUESTION/VRAAG 7**

|       |                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                     |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7.1   | OD = 60 units/ <i>eenhede</i>                                                                                                                                                                                                                                                                            | ✓length/ <i>lengte</i> <b>A</b><br>(1)                                                                                                                                                                                                                                                                                                              |
| 7.2   | $x$ - intercepts / <i>afsnitte</i> $y = 0$<br>$(x + 2)(x^2 - x - 30) = 0$<br>$(x + 2)(x - 6)(x + 5) = 0$ <b>OR/OF</b><br>$x + 2 = 0$ or/of $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-30)}}{2(1)}$<br>$\therefore x = -2$ or/of $x = 6$ or/of $x = -5$<br>$\therefore A(-5;0)$ and/en $\therefore C(6;0)$ | ✓quadratic factor/ <i>kwadr. faktor</i> <b>A</b><br>✓factors/ <i>faktore</i> / <b>SF</b> <b>CA</b><br><br>✓coordinates of/ <i>koördinate van</i> A <b>CA</b><br>✓coordinates of/ <i>koördinate van</i> C <b>CA</b><br><b>AO: Full marks/Volpunte</b><br>(4)                                                                                         |
| 7.3   | $f'(x) = 3x^2 + 2x - 32 = 0$<br>$x = \frac{-(2) \pm \sqrt{(2)^2 - 4(3)(-32)}}{2(3)}$<br>$\therefore x \approx -3,62$ or/of $x \approx 2,95$<br>$f(2,95) = (2,95)^3 + (2,95)^2 - 32(2,95) - 60 \approx -120,03$<br>$\therefore G(-3,62; -120,03)$                                                         | ✓derivative/ <i>afgeleide</i> <b>A</b><br>✓equating derivative to 0/ <i>stel afgeleide gelyk aan 0</i> <b>A</b><br>✓ <b>SF</b> <b>CA</b><br><br>✓both values of / <i>beide waardes van</i> $x$ <b>CA</b><br>✓correct value of / <i>korrekte waarde van</i> $y$ <b>CA</b><br>✓coordinates of/ <i>koördinate van</i> G <b>CA</b><br><b>NPR</b><br>(6) |
| 7.4.1 | $-5 \leq x \leq -2$<br><b>OR/OF</b><br>$x \in [-5; -2]$<br><b>OR/OF</b><br>$x \geq -5$ and/en $x \leq -2$<br>Accept: From $-5$ to $-2$ / <i>Aanvaar: Vanaf <math>-5</math> tot <math>-2</math></i>                                                                                                       | ✓critical values/ <i>kritieke waardes</i> <b>CA</b><br>✓correct notation/ <i>korrekte notasie</i> <b>A</b><br>(2)                                                                                                                                                                                                                                   |
| 7.4.2 | $-3,62 < x < 2,95$<br><b>OR/OF</b><br>$x \in (-3,62; 2,95)$<br><b>OR/OF</b><br>$x > -3,62$ and/en $x < 2,95$<br>Accept: Between $-3,62$ and $2,95$<br>/ <i>Aanvaar: Tussen <math>-3,62</math> en <math>2,95</math></i>                                                                                   | ✓critical values/ <i>kritieke waardes</i> <b>CA</b><br>✓correct notation/ <i>korrekte notasie</i> <b>A</b><br><br><b>NPR</b><br>(2)                                                                                                                                                                                                                 |
|       |                                                                                                                                                                                                                                                                                                          | <b>[15]</b>                                                                                                                                                                                                                                                                                                                                         |

**QUESTION/VRAAG 8**

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                         |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.1 | R10 000<br><b>Refer to the Addendum/ Verwys na die Addendum</b>                                                                                                                                                                                                                                                                                                                                                                                                                          | ✓R10 000<br><b>A</b><br>(1)                                                                                                                                                                                                                                                             |
| 8.2 | $P'(x) = -60x^2 + 6\,000$                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ✓ derivative/ afgeleide<br><b>A</b><br>(1)                                                                                                                                                                                                                                              |
| 8.3 | <p>For maximum / Vir maksimum:</p> <p><math>P'(x) = 0</math></p> <p><math>-60x^2 + 6\,000 = 0</math></p> <p><math>-60(x+10)(x-10) = 0</math></p> <p style="text-align: center;"><b>OR/OF</b></p> $x = \frac{-(0) \pm \sqrt{(0)^2 - 4(-60)(6\,000)}}{2(-60)}$ <p style="text-align: center;"><b>OR/OF</b></p> $x^2 = \frac{6\,000}{60}$ <p><math>x = 10</math> or/of <math>x \neq -10</math></p> <p><math>P(10) = -20(10)^3 + 6\,000(10) - 10\,000</math><br/><math>= R30\,000</math></p> | <p>✓ equating derivative to/ stel afgeleide aan 0<br/><b>A</b></p> <p>✓ factors/faktore /SF<br/><b>CA</b></p> <p>✓ correct value of x/ korrekte waarde vir x<br/><b>CA</b></p> <p>✓SF<br/><b>CA</b></p> <p>✓ Maximum Profit / maksimum wins<br/><b>CA</b></p> <p><b>NPU</b><br/>(5)</p> |
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>[7]</b>                                                                                                                                                                                                                                                                              |

**QUESTION/VRAAG 9**

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                               |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9.1.1 | $\int -\frac{6}{x} dx = -6 \ln x + C$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ✓ $-6 \ln x$ <b>A</b><br>✓ $C$ <b>A</b><br><b>(2)</b>                                                                                                                                                                                         |
| 9.1.2 | $\int (3x - 4)(x + 2) dx$<br>$= \int (3x^2 + 2x - 8) dx$<br>$= x^3 + x^2 - 8x + C$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ✓ <b>S</b> <b>A</b><br>✓ $x^3$ <b>CA</b><br>✓ $x^2$ <b>CA</b><br>✓ $-8x + C$ <b>CA</b><br><b>(4)</b>                                                                                                                                          |
| 9.2.1 | $\int 2^x dx = \frac{2^x}{\ln 2} + C$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ✓ $\frac{2^x}{\ln 2} + C$ <b>A</b><br><b>(1)</b>                                                                                                                                                                                              |
| 9.2.2 | $A = \int_{-2}^0 f(x) dx = \int_{-2}^0 2^x dx$<br>$= \left[ \frac{2^x}{\ln 2} \right]_{-2}^0$<br>$= \left[ \frac{2^0}{\ln 2} \right] - \left[ \frac{2^{-2}}{\ln 2} \right] = \frac{3}{\ln 2}$<br>$= \frac{3}{\ln 2}$ <b>OR/OF</b> $\approx 1,08 \text{ units}^2 / \text{eenhede}^2$<br>$B = \int_2^3 f(x) dx = \int_2^3 2^x dx = \left[ \frac{2^x}{\ln 2} \right]_2^3$<br>$= \left[ \frac{2^3}{\ln 2} \right] - \left[ \frac{2^2}{\ln 2} \right] = \frac{4}{\ln 2}$<br>$= \frac{4}{\ln 2}$ <b>OR/OF</b> $\approx 5,77 \text{ units}^2 / \text{eenhede}^2$<br>$\therefore \frac{B}{A} = \frac{4}{\ln 2} - \frac{\frac{3}{\ln 2}}{\ln 2} = \frac{16}{3}$ <b>OR/OF</b> $\therefore \frac{B}{A} = \frac{5,77}{1,08} = 5,34$<br><br><b>OR/OF</b> | ✓ Area notation using integrals/Area-notasie met gebruik van integrale <b>M</b><br><br>✓ <b>SF</b> <b>CA</b><br><br>✓ A value / waarde <b>CA</b><br><br>✓ <b>SF</b> <b>CA</b><br><br>✓ B value / waarde <b>CA</b><br><br>✓ <b>M</b> <b>CA</b> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                            |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
|  | $B - 4A = \frac{4}{\ln 2} - 4 \left( \frac{\frac{3}{4}}{\ln 2} \right) \quad \text{OR/OF} \approx 5,77 - 4(1,08)$ $= \frac{1}{\ln 2} \approx 1,45$ <p style="text-align: center;"><b>OR/OF</b></p> $B > 4A \quad \frac{4}{\ln 2} > 4 \left( \frac{\frac{3}{4}}{\ln 2} \right) \quad \text{OR/OF} \quad 5,77 > 4(1,08)$ $\frac{4}{\ln 2} > \frac{3}{\ln 2} \quad 5,77 > 4,32$ <p>∴ The learner's claim is <b>NOT VALID</b> / Die leerder se bewering is <b>NIE GELDIG NIE</b>.</p> | <p>✓ Conclusion / Gevolgtrekking<br/><b>CA</b><br/>(7)</p> |
|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>[14]</b>                                                |
|  | <b>TOTAL/TOTAAL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>[150]</b>                                               |