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**SENIOR CERTIFICATE/SENIOR SERTIFIKAAT
NATIONAL SENIOR CERTIFICATE/
NASIONALE SENIOR SERTIFIKAAT**

TECHNICAL MATHEMATICS P1/TEGNIIESE WISKUNDE V1

NOVEMBER 2020

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

MARKING CODES/NASIENKODES	
A	Accuracy/Akkuraatheid
AO	Answer only/Slegs antwoord
CA	Consistent accuracy/Volgehoue akkuraatheid
M	Method/Metode
R	Rounding/Afronding
NPR	No penalty for rounding/Geen penalisering vir afronding nie
NPU	No penalty for omitting unit/Geen penalisering vir eenhede weggelaat nie
S	Simplification/Vereenvoudiging
F	Correct formula/Korrekte formule
SF	Substitution in correct formula/Vervanging in korrekte formule

**These marking guidelines consist of 26 pages./
Hierdie nasienriglyne bestaan uit 26 bladsye.**

NOTE:

- If a candidate answers a question **TWICE**, only mark the **FIRST** attempt.
- Consistent accuracy to be applied as indicated on the marking guidelines.
- # Shows questions where a Tolerance Range will be applied are **Q3.1; Q3.3.2; Q4.1.2 & Q5.3.2**

LET WEL:

- Indien 'n kandidaat 'n vraag **TWEE** keer beantwoord, sien slegs die **EERSTE** poging na.
- Volgehoue akkuraatheid sal toegepas word soos op die nasienriglyne aangedui.
- # Toon vrae waar Toleransie Wydte (Verdraagsaamheids omvang) toegepas word is **Q3.1; Q3.3.2; Q4.1.2 & Q5.3.2**

QUESTION/VRAAG 1

1.1.1(a)	$(12 + 2x)$ OR/OF $(12 + x + x)$	✓ length/lengte	A (1)
1.1.1(b)	$(3 + 2x)$ OR/OF $(3 + x + x)$	✓ breadth/breedte	A (1)
1.1.2	$\text{Area} = \text{length} \times \text{breadth/lengte} \times \text{breedte}$ $= (12 + 2x)(3 + 2x)$ $= 36 + 24x + 6x + 4x^2$ $= 4x^2 + 30x + 36$	✓✓ SF	CA (2)
1.1.3	$4x^2 + 30x + 36 = 52$ $4x^2 + 30x - 16 = 0$ OR/OF $2x^2 + 15x - 8 = 0$ $2(2x-1)(x+8) = 0$ OR/OF $x = \frac{-(15) \pm \sqrt{(15)^2 - 4(2)(-8)}}{2(2)}$ $x = \frac{1}{2}$ or/of $x \neq -8$ $\text{Outside length / buite lengte} = 12\text{ m} + 2\left(\frac{1}{2}\right)\text{ m} = 13\text{ m}$	✓ equation/vergelyking CA ✓ factors/formula faktore/formule CA ✓ both x values/beide x- waardes CA ✓ length/lengte CA	NPU (4)

1.2.1	$\frac{3}{x} = 7x - 5$ $7x^2 - 5x - 3 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(7)(-3)}}{2(7)}$ $x = \frac{5 \pm \sqrt{109}}{14}$ $x \approx 1,10 \quad \text{or / of} \quad x \approx -0,39$	✓ standard form/ standaardvorm A ✓ SF CA ✓ both values of x/beide x-waardes CA NPR (3)
1.2.2	$\therefore x \in \left\{ \text{Real numbers / Reële getalle} \right\}$ OR/OF $x \in (-\infty ; \infty)$ OR/OF $x \in \square$	✓ $x \in \text{Real Numbers} /$ Reële getalle A (1)
1.3	$y - x = 3 \text{ and /en } 3x^2 + xy - y^2 = -3$ $y = x + 3$ $3x^2 + x(x+3) - (x+3)^2 = -3$ $3x^2 + x^2 + 3x - (x^2 + 6x + 9) + 3 = 0$ $3x^2 - 3x - 6 = 0 \quad \text{OR/OF} \quad x^2 - x - 2 = 0$ $3(x-2)(x+1) = 0 \quad \text{OR/OF} \quad x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-2)}}{2(1)}$ $\therefore x = 2 \text{ or /of } x = -1$ $y = 2 + 3 = 5 \text{ or /of } y = -1 + 3 = 2$ OR/OF $y - x = 3 \quad \text{and/en} \quad 3x^2 + xy - y^2 = -3$ $x = y - 3$ $3(y-3)^2 + y(y-3) - y^2 = -3$ $3y^2 - 18y + 27 + y^2 - 3y - y^2 + 3 = 0$ $3y^2 - 21y + 30 = 0 \quad \text{OR/OF} \quad y^2 - 7y + 10 = 0$ $3(y-2)(y-5) = 0 \quad \text{OR/OF} \quad y = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(1)(10)}}{2(1)}$ $\therefore y = 2 \text{ or /of } y = 5$ $x = 2 - 3 = -1 \text{ or /of } x = 5 - 3 = 2$	✓ subject/onderwerp A ✓ substitution/vervanging CA ✓ S CA ✓ factors/faktore or/of formula CA ✓ both x-values/ beide x-waardes CA ✓ both y-values/ beide y-waardes CA OR/OF ✓ subject/onderwerp A ✓ substitution/vervanging CA ✓ S CA ✓ factors/faktore or/of formula CA ✓ both y-values/beide y- waardes CA ✓ both x-values/beide x- waardes CA (6)

1.4.1	$X_c = \frac{1}{2\pi f C}$ $f = \frac{1}{2\pi X_c C} \quad \text{OR/OF} \quad f = (2\pi X_c C)^{-1}$	✓ making f the subject/ <i>maak f die onderwerp</i> A (1)																																
1.4.2	$f = \frac{1}{2\pi X_c C}$ $= \frac{1}{2\pi \times 63,66 \times 50 \times 10^{-6}} \quad \text{OR/OF} \quad (2\pi \times 63,66 \times 50 \times 10^{-6})^{-1}$ $\approx 50 \text{ hertz}$ OR/OF $X_c = \frac{1}{2\pi f C}$ $63,66 = \frac{1}{2\pi f \times 50 \times 10^{-6}}$ $f = \frac{1}{2\pi \times 63,66 \times 50 \times 10^{-6}}$ $\approx 50 \text{ hertz}$	✓ substitution/ <i>vervanging</i> CA ✓ value of/ <i>waarde van f</i> CA OR/OF ✓ substitution/ <i>vervanging</i> CA ✓ value of/ <i>waarde van f</i> CA NPR NPU (2)																																
1.5.1	$110011_2 + 111101_2 = 1110000_2$ OR/OF $32 + 16 + 2 + 1 + 32 + 16 + 8 + 1 = 112 = 1110000_2$	✓ correct sum/ <i>korrekte som</i> A (1)																																
1.5.2	<table><tr><td>2^6</td><td>2^5</td><td>2^4</td><td>2^3</td><td>2^2</td><td>2^1</td><td>2^0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table> $= 64 + 32 + 16 = 112$ OR/OF <table><tr><td>2^5</td><td>2^4</td><td>2^3</td><td>2^2</td><td>2^1</td><td>2^0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td></tr></table> $51 + 61 = 112$	2^6	2^5	2^4	2^3	2^2	2^1	2^0	1	1	1	0	0	0	0	2^5	2^4	2^3	2^2	2^1	2^0	1	1	0	0	1	1	1	1	1	1	0	1	✓ M CA ✓ decimal/ <i>desimaal</i> CA OR/OF ✓ M CA ✓ decimal/ <i>desimaal</i> CA AO: Full marks/ <i>Volpunte</i> (2) [24]
2^6	2^5	2^4	2^3	2^2	2^1	2^0																												
1	1	1	0	0	0	0																												
2^5	2^4	2^3	2^2	2^1	2^0																													
1	1	0	0	1	1																													
1	1	1	1	0	1																													

QUESTION/VRAAG 2

2.1.1	$3x^2 + 2x + 2 = 0$ $\Delta = b^2 - 4ac$ $= (2)^2 - 4 \times 3 \times 2$ $= -20$	✓ substitution/vervanging A ✓ value of/waarde van Δ CA AO: Full marks/ Volpunte (2)
2.1.2	non-real/ <i>nie-reël</i>	✓ description/beskrywing CA Accept imaginary/ aanvaar imaginêr (1)
2.2.1	$x^2 - 2px = 3p^2$ $x^2 - 2px - 3p^2 = 0$ OR/OF $-x^2 + 2px + 3p^2 = 0$	✓ standard form/ standaardvorm A (1)
2.2.2	$\Delta = (-2p)^2 - 4(1)(-3p^2)$ $\Delta = 4p^2 + 12p^2$ $= 16p^2$ Δ is a perfect square $\therefore$ roots will be rational/ Δ is volkome vierkant $\therefore$ die wortels is rasionaal	✓ subst. in discriminant/ vervanging in dikriminant CA ✓ S CA ✓ perfect square/ Volkome vierkant CA (3) [7]

QUESTION/VRAAG 3

3.1.1 #	$\frac{\log 3 + \log 27}{\log 81 - \log 9}$ $= \frac{\log 3 + \log 3^3}{\log 3^4 - \log 3^2}$ $= \frac{\log 3 + 3\log 3}{4\log 3 - 2\log 3}$ $= \frac{4\log 3}{2\log 3}$ $= 2$ OR/OF $\frac{\log 3 + \log 27}{\log 81 - \log 9}$ $= \frac{\log (3 \times 27)}{\log \left(\frac{81}{9} \right)}$ $= \frac{\log 81}{\log 9}$ $= \frac{\log 3^4}{\log 3^2} \quad \text{OR / OF} \quad \frac{\log 9^2}{\log 9} \quad \text{OR / OF} \quad \log_9 81$ $= \frac{4\log 3}{2\log 3} \quad \text{OR / OF} \quad \frac{2\log 9}{\log 9} \quad \text{OR / OF} \quad \log_9 9^2 = 2\log_9 9$ $= 2$	✓ prime bases/ Priem grondtalle A ✓ log property/eienskap CA ✓ S CA ✓ S CA OR/OF ✓ log property/eienskap A ✓ prime bases or log prop/ Priemgrondtalle of log eienskap CA ✓ S CA ✓ S CA AO: 1 mark/ punt
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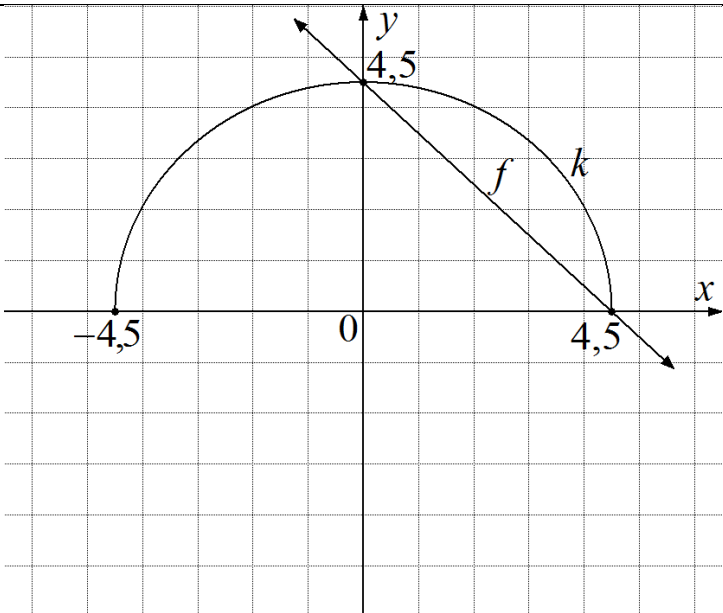
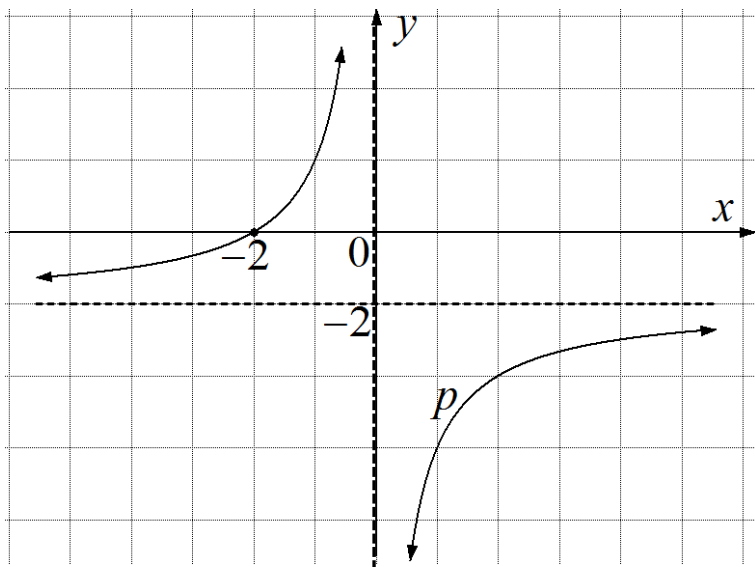
(4)

3.1.2 #	$\frac{2^n \sqrt{32} + 2^n \sqrt{2}}{2^n \sqrt{50}} = \frac{2^n \sqrt{2 \times 16} + 2^n \sqrt{2}}{2^n \sqrt{2 \times 25}}$ $= \frac{2^n 4\sqrt{2} + 2^n \sqrt{2}}{2^n \cdot 5\sqrt{2}}$ $= \frac{2^n \sqrt{2} (4 + 1)}{2^n \cdot 5\sqrt{2}}$ $= 1$ OR/OF $\frac{2^n \sqrt{32} + 2^n \sqrt{2}}{2^n \sqrt{50}} = \frac{2^n \sqrt{32}}{2^n \sqrt{50}} + \frac{2^n \sqrt{2}}{2^n \sqrt{50}}$ $= \frac{4\sqrt{2}}{5\sqrt{2}} + \frac{\sqrt{2}}{5\sqrt{2}}$ $= \frac{4}{5} + \frac{1}{5}$ $= 1$ OR/OF $\frac{2^n \sqrt{32} + 2^n \sqrt{2}}{2^n \sqrt{50}} = \frac{2^n (2^5)^{\frac{1}{2}} + 2^n 2^{\frac{1}{2}}}{2^n (5^2 \cdot 2)^{\frac{1}{2}}}$ $= \frac{2^n 2^{\frac{5}{2}} + 2^n 2^{\frac{1}{2}}}{2^n 5 \cdot 2^{\frac{1}{2}}}$ $= \frac{2^n 2^{\frac{1}{2}} (2^2 + 1)}{2^n 5 \cdot 2^{\frac{1}{2}}}$ $= 1$ OR/OF $\frac{2^n \sqrt{32} + 2^n \sqrt{2}}{2^n \sqrt{50}} = \frac{2^n (\sqrt{32} + \sqrt{2})}{2^n (\sqrt{50})}$ $= \frac{4\sqrt{2} + \sqrt{2}}{5\sqrt{2}}$ $= \frac{5\sqrt{2}}{5\sqrt{2}}$ $= 1$	✓ simplified surds/vereenv. wortelvorm A ✓ S CA ✓ common factor or like terms /gemene faktor of gelyke terme CA ✓ S CA OR/OF ✓ Separating terms/ skei terme A ✓ S CA ✓ S CA ✓ S CA OR/OF ✓ exponent form/eksponent vorm A ✓ S CA ✓ common factor/gemene faktor CA ✓ S CA OR/OF ✓ Common factor/gemene faktor A ✓ S CA ✓ common factor/gemene faktor CA ✓ S CA AO: 1 mark/ Punt (4)
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3.2	$\log_x 32 + \log_x 4 - \log_x 16 = \log_5 125$ $\log_x \frac{32 \times 4}{16} = \log_5 5^3$ $\log_x 8 = 3$ $x^3 = 8 = 2^3$ $\therefore x = 2$ OR/OF $\log_x 32 + \log_x 4 - \log_x 16 = \log_5 125$ $5\log_x 2 + 2\log_x 2 - 4\log_x 2 = 3\log_5 5$ $3\log_x 2 = 3$ $\log_x 2 = 1$ $\therefore x = 2$ OR/OF $\log_x 32 + \log_x 4 - \log_x 16 = \log_5 125$ $\log_x \frac{32 \times 4}{16} = \log_5 5^3$ $\log_x 8 = 3$ $x^3 = 2^3 \quad \text{OR/OF} \quad \log_x 2^3 = \log_x x^3$ $\therefore x = 2$	$\checkmark$ log property/eienskap A $\checkmark$ power form/magte vorm A $\checkmark$ S CA $\checkmark$ exp form/eksp. vorm CA $\checkmark$ value of/waarde van x CA OR/OF $\checkmark$ log property/eienskap A $\checkmark$ log identity/identiteit A $\checkmark$ S A $\checkmark$ S CA $\checkmark$ value of/waarde van x CA OR/OF $\checkmark$ log property/eienskap A $\checkmark$ power form/magte vorm A $\checkmark$ S CA $\checkmark$ exp form/eksp. vorm CA $\checkmark$ value of/waarde van x CA (5)
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3.3.1	$Z_T = 4 + 5i - 4 - 4i$ $= i$	✓ total impedance/totale impedansie A (1)
3.3.2 #	$Z_T = i$ $r = 1$ $\tan \theta = \frac{1}{0}$ $\theta = 90^\circ \quad \text{OR/OF} \quad \theta = \frac{1}{2}\pi$ $z_T = 1(\cos 90^\circ + i \sin 90^\circ) \quad \text{OR/OF} \quad z_T = 1\left(\cos \frac{1}{2}\pi + i \sin \frac{1}{2}\pi\right)$	✓ value of modulus/ waarde van modulus CA ✓ tan ratio/verhouding CA ✓ correct angle/korrekte hoek CA ✓ z in polar vorm/polêre vorm CA AO: 1 mark/punt (4)
3.4	$k = 6 + 4(i - 9) + 2mi$ $k - 2mi = 6 + 4i - 36$ $k - 2mi = -30 + 4i$ $\therefore k = -30 \quad \text{and/en} \quad -2m = 4$ $\therefore k = -30 \quad \text{and/en} \quad m = -2$ OR/OF $k = 6 + 4(i - 9) + 2mi$ $k - 6 = 4i - 36 + 2mi$ $k = -30 + (2m + 4)i$ $\therefore k = -30 \quad \text{and/en} \quad -2m = 4$ $\therefore k = -30 \quad \text{and/en} \quad m = -2$ OR/OF $k = 6 + 4(i - 9) + 2mi$ $k - 6 - 2mi = 4i - 36$ $k - 6 - 2mi = -36 + 4i$ $k - 6 = -36 \quad \text{and/en} \quad -2mi = 4i$ $\therefore k = -30 \quad \text{and/en} \quad m = -2$	✓ product/produk A ✓ S CA ✓ value of/waarde van k CA ✓ value of/waarde van m CA OR/OF ✓ product/produk A ✓ S CA ✓ value of/waarde van k CA ✓ value of/waarde van m CA OR/OF ✓ product/produk A ✓ S CA ✓ value of/waarde van k CA ✓ value of/waarde van m CA (4) [22]

QUESTION/VRAAG 4

4.1.1	$radius / radius = 4,5 \text{ units} / eenhede$	✓ length of radius/lengte van radius A (1)
4.1.2 #		CA from/vanaf Q/V4.1.1 f: ✓ both intercepts/beide afsnitte CA ✓ negative straight line /negatiewe reguitlyn CA k: ✓ x-intercepts/afsnitte CA ✓ y-intercept/afsnitte CA ✓ semi-circle/ halfsirkel CA (5)
4.1.3	$x \in [-4,5; 4,5]$ OR/OF $-4,5 \leq x \leq 4,5$	✓ end points/eindpunte CA ✓ correct notation/ korrekte notasie A (2)
4.2		✓ Horizontal asymptote/ horisontale asimptoot A ✓ x-intercept/afsnit A ✓ shape/vorm (both sections) A (3)

4.3.1(a)	T (0 ; 16)	✓coordinates of/ <i>koördinate van T</i> A (1)
4.3.1(b)	P (- 4 ; 0)	✓ - 4 A ✓ 0 A (2)
4.3.2	$g(x) = a(x - x_1)(x - x_2)$ $g(x) = a(x + 4)(x - 2)$ $16 = a(0 + 4)(0 - 2)$ $\therefore a = -2$ $g(x) = -2(x + 4)(x - 2)$ OR/OF $-\frac{b}{2a} = -1$ $\therefore g(x) = -2x^2 - 4x + 16$ $-\frac{b}{2(-2)} = -1$ $\therefore g'(x) = 2ax + b = 0$ OR/OF $2(-2)(-1) + b = 0$ $\therefore b = -4$ OR/OF subst./ verv. U (2 ; 0): $0 = a(2)^2 + b(2) + 16$ $4a + 2b = -16$(1) subst./ verv. S (1 ; 10): $10 = a(1)^2 + b(1) + 16$ $a + b = -6 \Rightarrow 2a + 2b = -12$(2) (1) - (2): $2a = -4$ $\therefore a = -2$ $2(-2) + 2b = -12$ $\therefore b = -4$ OR/OF	✓substitution in intercept form/ <i>vervanging in afsnitvorm</i> CA ✓value of/waarde van a CA ✓substitution/ <i>vervanging</i> CA ✓value of/waarde van b CA OR/OF ✓substitution/vervanging A ✓substitution/vervanging A ✓value of/waarde van a CA ✓value of/waarde van b OR/OF

	$y = a(x + p)^2 + q$ $y = a(x + 1)^2 + q$ Subst./verv. (2;0) : $0 = a(2 + 1)^2 + q$ $0 = 9a + q \dots \dots \dots (1)$ Subst./verv. (1;10) : $10 = a(1 + 1)^2 + q$ $10 = 4a + q \dots \dots \dots (2)$ (1) – (2) $-10 = 5a$ $\therefore a = -2$ $10 = 4a + q$ $10 = 4(-2) + q$ $\therefore q = 18$ $y = -2(x + 1)^2 + 18$ $= -2x^2 - 4x - 16$ $\therefore b = -4$	✓substitution/vervanging A ✓substitution/vervanging A ✓value of/waarde van a CA ✓value of/waarde van b (4)
4.3.3	$g(x) = -2x^2 - 4x + 16$ subst. / verv. $x = -1$ $g(-1) = -2(-1)^2 - 4(-1) + 16$ $y = 18$ OR/OF (R(-1; 18))	✓substitution/vervanging CA (Q4.3.2) ✓ y-coordinate of/ koördinate van R CA OR/OF ✓✓ y-coordinate of/ koördinate van R CA (2)
4.3.4	$h(x) = k^x + 8$ $10 = k^1 + 8$ $\therefore k = 2$ $h(x) = 2^x + 8$	✓value of/waarde van q A ✓substitution/ vervanging A ✓value of/waarde van k A (3)
4.3.5	$y > 8$ OR/OF $y \in (8; \infty)$	✓range/waarde-versameling A (1)

4.3.6	subst./ verv. $x = -1$ At W: $y = 2^{-1} + 8 = \frac{17}{2} = 8,5$ $VW = \frac{17}{2} - 8$ OR/OF $VW = 8,5 - 8$ $= 0,5$ units / eenhede OR/OF At W: $y = 2^{-1} + 8 = \frac{17}{2} = 8,5$ $VW = \sqrt{(1-1)^2 + (8,5-8)^2}$ $= \sqrt{0,25}$ $= 0,5$ units/eenhede OR/OF $h(x) = 2^x + 8$ eq. of the asympt./ verg. van asimpt. $y = 8$ $VW = 2^x + 8 - 8 = 2^x$ $x = -1$ $\therefore VW = 2^{-1} = 0,5$ units/eenhede	✓ value of/waarde van y at/by W A ✓ M CA ✓ length of/lengte van VW CA OR/OF ✓ value of/waarde van y at/by W A ✓ M CA ✓ length of/lengte van VW CA OR/OF ✓ value of/waarde van y at/by W A ✓ M CA ✓ length of/lengte van VW CA AO: Full marks/ Volpunte (3) [27]
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QUESTION/VRAAG 5

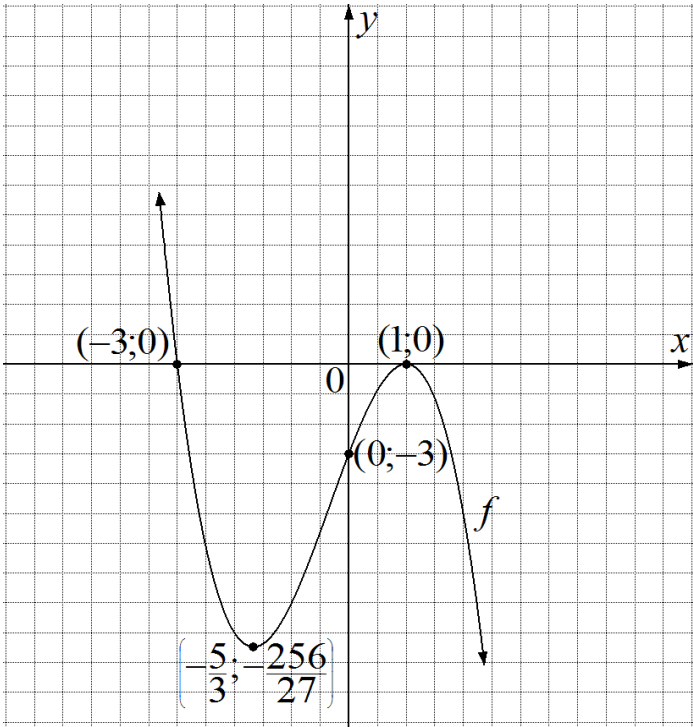
5.1.1	90% of / van R 250 000 = R 225 000 OR/OF 10 % of / van R 250 000 = R 25 000 Loan value/leningswaarde: R 250 000 – R25 000 = R 225 000	✓ Loan value/waarde van lening A OR/OF ✓ Loan value/waarde van lening A (1)
5.1.2	$i_{eff.} = \left(1 + \frac{i_{nom.}}{m}\right)^m - 1$ $i_{eff.} = \left(1 + \frac{6,3\%}{12}\right)^{12} - 1$ $\therefore i_{eff.} \approx 6,5\%$ OR/OF $A = P(1 + i)^n$ Let/ Laat P = R100 $A = 100 \left(1 + \frac{6,3\%}{12}\right)^{12}$ = R106, 49 interest / rente = R106, 49 – R100 = 6, 49 $\therefore i \approx 6, 49 \approx 6, 5$	✓ F A ✓ SF A ✓ value of i_{eff} greater than. / waarde van i_{eff} groter as 6,3% CA OR/OF ✓ F A ✓ SF A ✓ value of i_{eff} greater than. / waarde van i_{eff} groter as 6,3% CA AO: Full marks /Volpunte NPR (3)

5.3.2 #	Value of the investment after change in interest rate for 2 years/ waarde van belegging na rentekoersverandering vir 2 jaar: $A = R94558,53 \left(1 + \frac{6\%}{12}\right)^{2 \times 12}$ $\approx R106582,57$ Value of the investment after withdrawing/waarde van belegging na onttrekking: $P = R106582,57 - R20\,000 = R86582,57$ YES it will be more./JA dit sal meer wees. OR/OF $A = R94558,53 \left(1 + \frac{6\%}{12}\right)^{4 \times 12} - 20\,000 \left(1 + \frac{6\%}{12}\right)^{2 \times 12}$ $\approx R\,97\,592,39$ YES, it will be more./JA dit sal meer wees. OR/OF $A = \left[R94558,53 \left(1 + \frac{6\%}{12}\right)^{2 \times 12} - 20\,000 \right] \times \left(1 + \frac{6\%}{12}\right)^{2 \times 12}$ $\approx R\,97\,592,39$ YES, it will be more./JA dit sal meer wees.	CA from/vanaf Q/V 5.3.1 ✓✓SF CA ✓ R106582,57 CA ✓M subtracting/ aftrek A 20000 CA ✓ difference/ Verskil CA ✓ conclusion/ gevolgtrekking CA OR/OF ✓M A ✓SF CA ✓ $\left(1 + \frac{6\%}{12}\right)^{4 \times 12}$ A ✓ $\left(1 + \frac{6\%}{12}\right)^{2 \times 12}$ A ✓ value of/ waarde van A_{final} CA ✓ conclusion/ gevolgtrekking CA OR/OF ✓M A ✓SF CA ✓✓ value of/waarde van i and n A ✓ value of/waarde van A_{final} CA ✓ conclusion/ gevolgtrekking CA NPR (6) [16]
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QUESTION/VRAAG 6

6.1	$f(x) = \frac{1}{2}x$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{\left(\frac{1}{2}(x+h)\right) - \left(\frac{1}{2}x\right)}{h}$ $= \lim_{h \rightarrow 0} \frac{\frac{1}{2}x + \frac{1}{2}h - \frac{1}{2}x}{h} \quad \text{OR/OF} \quad = \lim_{h \rightarrow 0} \frac{\frac{x}{2} + \frac{h}{2} - \frac{x}{2}}{h}$ $= \lim_{h \rightarrow 0} \frac{\frac{1}{2}h}{h} \quad \text{OR/OF} \quad = \lim_{h \rightarrow 0} \frac{\frac{1}{2}}{1}$ $\therefore f'(x) = \lim_{h \rightarrow 0} \frac{1}{2} = \frac{1}{2}$	✓definition/definisie A ✓SF A ✓S CA $\frac{1}{2}$ CA Penalty of 1 mark if incorrect notation used/ 1 punt penaliseering vir verkeerde notasie AO: 0 marks/ punte (4)
6.2.1	$\frac{dA}{dr} = 2\pi r$	✓derivative/afgeleide A (1)
6.2.2	$D_x \left[(x - \sqrt{x})^2 \right]$ $= D_x \left[\left(x - x^{\frac{1}{2}} \right) \left(x - x^{\frac{1}{2}} \right) \right]$ $= D_x \left[x^2 - 2x^{\frac{3}{2}} + x \right]$ $= 2x - 3x^{\frac{1}{2}} + 1$	✓exponent vorm/ eksp vorm A ✓S CA ✓2x CA ✓$-3x^{\frac{1}{2}}$ CA ✓1 CA No Penalty for incorrect notation used/ geen penaliseering vir verkeerde notasie (5)

6.3	$g(x) = ax^2 - x \text{ sub } (-1; -1)$ $-1 = a(-1)^2 - (-1)$ $-1 = a + 1$ $a = -2$ OR/OF $3x - y + 2 = 0$ $y = 3x + 2$ $\therefore m_{\text{tan/raakl.}} = 3$ $g(x) = ax^2 - x$ $g'(x) = 2ax - 1$ $2a(-1) - 1 = 3$ $-2a = 3 + 1$ $a = -2$ OR/OF $ax^2 - x = 3x + 2$ $ax^2 - 4x - 2 = 0$ $b^2 - 4ac = 0 \text{ (equal roots) tangent touches)}$ $(-4)^2 - 4(a)(-2) = 0$ $16 + 8a = 0$ $a = -2$	$\checkmark\checkmark$ subst/ verv A $\checkmark$ S CA $\checkmark\checkmark$ value of/ waarde van A CA OR/OF $\checkmark$ gradient of tan./grad van A rklyn $\checkmark$ derivative/afgeleide A $\checkmark$ $g'(x) = 3$ CA $\checkmark$ substitution/vervanging CA $\checkmark$ value of/ waarde van a CA OR/OF $\checkmark$ equating/ vergelyk A $\checkmark$ std form/ vorm A $\checkmark$ equal roots/ gelyke CA wortels $\checkmark$ S CA $\checkmark$ value of/ waarde van a CA (5) [15]
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7.4		✓cubic shape/vorm A ✓y-intercepts/afsnitte CA from/vanaf QV7.1 ✓both/albei x-intercepts/afsnitte CA from/vanaf QV7.2 ✓both turning points/ draaipunte CA from/vanaf QV7.3 (4) Using calculator to generate table, maximum 3 marks/ gebruik van 'n sakrekenaar om 'n tabel te genereer: maksimum 3 punte
7.5	$-\frac{5}{3} < x < 1$ OR/OF $x \in \left(-\frac{5}{3}; 1\right)$	CA from/vanaf Q/V7.4 ✓both end points/beide eindpunte CA ✓notation/notasie A (2) [14]

QUESTION/VRAAG 8

8.1.1	$D(10) = -0,5(10)^2 + 20(10)$ $= 150 \text{ m}$	✓ distance/afstand A NPU (1)
8.1.2	velocity = $D'(t) = -t + 20$ $D'(12) = -(12) + 20$ $= 8 \text{ m/s}$	✓ derivative/afgeleide A ✓ substitution in derivative/ Vervangingin afgeleide CA ✓ velocity/snelheid CA NPU (3)
8.2.1(a)	TSA/TBO. = $(4x)(3x) + (5x)(y) + (4x)(y) + (3x)(y)$ $= 12x^2 + 5xy + 4xy + 3xy$ $3600 = 12x^2 + 12xy$ $300 = x^2 + xy$ $xy = 300 - x^2$ $\therefore y = \frac{300 - x^2}{x}$ OR/OF TSA/TBO = $(3x + 4x + 5x)y + 2\left(\frac{1}{2} \cdot 3x \cdot 4x\right)$ $12xy + 12x^2 = 3600$ $300 = x^2 + xy$ OR/OF $xy = 300 - x^2$ $\therefore y = \frac{300 - x^2}{x}$	✓ area/oppervlakte A ✓ equat. area to/stel oppervl gelyk 3 600 A ✓ S CA OR/OF ✓ area/oppervlakte A ✓ equat. area to 3 600/stel oppervl gelyk A ✓ S CA (3)
8.2.1(b)	$V = \frac{1}{2}(3x)(4x)\left(\frac{300 - x^2}{x}\right)$ $= 6x(300 - x^2)$ $= 1800x - 6x^3$	✓ SF CA ✓ S CA (2)
8.2.2	$V = 1800x - 6x^3$ $\frac{dV}{dx} = 1800 - 18x^2$ $1800 - 18x^2 = 0$ OR/OF $18(100 - x^2) = 0$ $x^2 = 100$ $\therefore x = 10$	✓ derivative/afgeleide CA ✓ equating derivative to 0/gelykstel van afgeleide aan 0 A ✓ value of/waarde van x CA (3) [12]

QUESTION/VRAAG 9

Penalize for constant C in either Q 9.1.1 or Q 9.1.2 / Penaliseer vir konstante C in of V9.1.1 of V9.1.2			
9.1.1	$\int 2^x dx$ $= \frac{2^x}{\ln 2} + C$	$\checkmark \frac{2^x}{\ln 2}$ $\checkmark C$	A A (2)
9.1.2	$\int \left(\sqrt{x} + \frac{7}{x} + 4x^{-5} \right) dx$ $= \int \left(x^{\frac{1}{2}} + \frac{7}{x} + 4x^{-5} \right) dx$ $= \frac{2}{3} x^{\frac{3}{2}} + 7 \ln x - x^{-4} + C$ OR/OF $= \frac{2}{3} x^{\frac{3}{2}} + 7 \ln x - \frac{1}{x^4} + C$ OR/OF $= \frac{x^{\frac{3}{2}}}{\frac{3}{2}} + 7 \ln x - \frac{1}{x^4} + C$	$\checkmark \text{power vorm/magte vorm}$ $\checkmark \frac{2}{3} x^{\frac{3}{2}} \quad \text{OR/OF} \quad \frac{x^{\frac{3}{2}}}{\frac{3}{2}}$ $\checkmark 7 \ln x$ $\checkmark -x^{-4}$ $\text{OR / OF } -\frac{1}{x^4} \dots\dots$	A CA A A (4)

9.2	Area above the x - axis/ <i>oppervlakte bo die x - as</i> : $= \int_{-3}^2 (-x^2 - x + 6) dx$ $= \left[-\frac{x^3}{3} - \frac{x^2}{2} + 6x \right]_{-3}^2$ $= \left(-\frac{(2)^3}{3} - \frac{(2)^2}{2} + 6(2) \right) - \left(-\frac{(-3)^3}{3} - \frac{(-3)^2}{2} + 6(-3) \right)$ $= \frac{125}{6} \text{ square units/vk.eenhede}$ Unshaded area / <i>ongearseerde oppvlk</i> $= \frac{125}{6} - \frac{34}{3}$ $= \frac{19}{2} \text{ square units / vk.eenhede}$ $\therefore$ the unshaded area is LESS than the shaded area/<i>Die ongearseerde oppvlk is MINDER as die gearseerde oppervlakte.</i> OR/OF	✓ area notation using integrals/<i>oppervl notasie deur integrale</i> A ✓ integration/<i>integrasië</i> A ✓✓ subst./verv. CA ✓S CA ✓M unshaded area/<i>ongearseerde oppvlk</i> CA ✓ conclusion/<i>gevolgtrknng</i> CA OR/OF
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Unshaded area above the x - axis/ <i>ongearseerde oppvlk bo die x - as :</i>	
$= \left[\int_{-3}^{-1} (-x^2 - x + 6) dx \right] + \left[\int_1^2 (-x^2 - x + 6) dx \right]$	✓ area notation using Integrals/ <i>oppervl notasie deur integrale</i> A
Unshaded area/ <i>ongearseerde oppvlk 1:</i>	
$= \left[-\frac{x^3}{3} - \frac{x^2}{2} + 6x \right]_{-3}^{-1}$	✓ integration/ <i>integrasie</i> A
$= \left[\left(-\frac{(-1)^3}{3} + -\frac{(-1)^2}{2} + 6(-1) \right) - \left(-\frac{(-3)^3}{3} - \frac{(-3)^2}{2} + 6(-3) \right) \right]$	✓ subst./ <i>verv.</i> CA
$= \frac{22}{3} \text{ square units/vk.eenhede}$	
Unshaded area/ <i>ongearseerde oppvlk 2:</i>	\
$= \left[-\frac{x^3}{3} - \frac{x^2}{2} + 6x \right]_1^2$	
$= \left[\left(-\frac{(2)^3}{3} - \frac{(2)^2}{2} + 6(2) \right) - \left(-\frac{(1)^3}{3} - \frac{(1)^2}{2} + 6(1) \right) \right]$	✓ subst./ <i>verv</i> CA
$= \frac{13}{6} \text{ square units/vk.eenhede}$	✓ S CA
$\therefore \text{Total unshaded area} = \frac{22}{3} + \frac{13}{6} = \frac{19}{2} \text{ square units}$	✓ M unshaded area/ <i>ongearseerde opperv</i> CA
∴ The unshaded area is LESS than the shaded area/ <i>Die ongearseerde oppervlakte is MINDER as die gearseerde oppervlakte.</i>	✓ conclusion/ <i>gevolgtrkng</i> CA
	AO (conclusion gevolgtrekking): 1 mark/ punt
	(7) [13]

TOTAL/TOTAAL: 150

ADDENDUM

TECHNICAL MATHEMATICS/ TEGNIESE WISKUNDE

Paper 1/ Vraestel 1 November 2020

FINAL MARKING GUIDELINES (ADDITIONAL NOTES)

FINALE NASIEN RIGLYNE (ADDISIONELE NOTAS)

ITEM	DESCRIPTION/ VERKLARING
1.1.2	Factors must have a variable x and product should lead to a quadratic equation. <i>Faktore moet 'n onbekende x en die produk moet lei na 'n kwadratiese vergelyking</i>
1.1.3	If $4x^2 + 30x - 16 = 0$ is used and leading to negative x -values with not valid conclusion, maximum 2 marks <i>Indien $4x^2 + 30x - 16 = 0$ gebruik word en lei na negatiewe x-waardes met nie geldige gevolgtrekking, maksimum 2 punte</i>
1.2.1	Linear equation, no marks / liniêre vergelyking: geen punt
1.3	If simplification leads to linear equation, maximum 3 marks <i>Indien vereenvoudiging lei na 'n liniêre vergelyking; maksimum 3 punte</i>
1.5.1	If base 2 is omitted, no penalty / indien grondtal 2 uitgelaat is; geen penalisering
2.2.1	Order of terms not necessary/ orde van terme nie belangrik
2.2.2.	- If p is omitted, accept $\Delta = 16$, maximum 2 marks/ indien p uitgelaat is aanvaar $\Delta = 16$ maksimum 2 punte - If Δ is irrational based on CA from Q2.2.1, maximum 3 marks/ Indien Δ irrasionaal is gebaseer op CA vanaf Q2.2.1, maksimum 3 punte
3.3.2 #	$\tan \theta = \frac{1}{0}$ can be implied/ kan geïmpliseer word - If 1 is omitted, no penalty/ indien 1 uitgelaat is, geen penaliseering - Accept/ aanvaar $Z_T = 1 \text{cis} 90^\circ$

ITEM	DESCRIPTION/ VERKLARING	
5.2	If: Year 1: $60 \div (1 - 5,3\%) = 63,45$ Year 2: $63,45 \div (1 - 5,3\%) = 67,09$ Year 3: $67,09 \div (1 - 5,3\%) = 70,94$ Year 4: $70,94 \div (1 - 5,3\%) = 75,01$ $\therefore 75$ workers/werkers	✓ F ✓ SF ✓ $n = 4$ ✓ Number of skilled workers/ <i>aantal geskoolde werkers</i> Maximum 4 marks/ maksimum 4 punte
	- Simple interest used , maximum 3 marks/<i>Enkelvoudige rente; maksimum 3 punte</i> - Depreciation Compound used,maximum 4 marks/ <i>Waardevermindering gebruik dan maksimum 4 punte</i>	
7.3	If derivative is first degree,maximum 2 marks/ <i>Indien afgeleide 'n eerstegraadsvergelyking is maksimum 2 punte</i>	
7.4	- If point by point plotted and Turning Point not shown maximum 3 marks/ <i>indien punt-vir-punt geplot en draaipunt nie getoon maksimum 3 punte</i> - If 2 Turning points are correctly plotted, award a mark./ <i>As twee draaipunte korrek geplot is, gee 'n punt</i>	