Education and Sport Development
Department of Education and Sport Development
Departement van Onderwys en Sportontwikkeling
Lefapha la Thuto le Tlhabololo ya Metshameko
NORTH WEST PROVINCE

GRADE/GRAAD 12

TECHNICAL MATHEMATICS P1/
TEGNIESE WISKUNDE V1
MEMORANDUM

MID YEAR 2018
HALFJAAR EKSAMEN 2018

MARKS: 150
PUNTE: 150

This memorandum consists of 11 pages.

Hierdie memorandum bestaan uit 11 bladsye.

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QUESTION 1 / VRAAG 1

1.1.1	$x(x+3) = 4$ $x^2 + 3x - 4 = 0$ $(x+4)(x-1) = 0$ $x = -4$ or $x = 1$	✓std form ✓ factorisation ✓both x values (3)
1.1.2	$x^2 - 6x - 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(-2)}}{2(1)}$ $x = \frac{6 \pm \sqrt{44}}{2(1)}$ $= 3 \pm \sqrt{11}$	✓sub. into the correct formula / vervang in die korrekte formule ✓ $x = \frac{6 \pm \sqrt{44}}{2(1)}$ ✓ answers in simplified form / antwoorde (3)
1.2	$2y + x = 3$ and $(x+y)(2x-y) = 0$ $x = 3 - 2y$ $(3 - 2y + y)[2(3-2y) - y] = 0$ $(3-y)(6-5y) = 0$ $y = 3$ or $y = \frac{6}{5}$ $x = 3 - 2(3) = -3$; $x = 3 - 2(\frac{6}{5}) = \frac{3}{5}$ OR	✓ $x = 3 - 2y$ ✓sub. of x into quadratic e/ vervang y in kwadratiese vergelyking ✓✓y values / waardes ✓✓x values / waardes (6) OR

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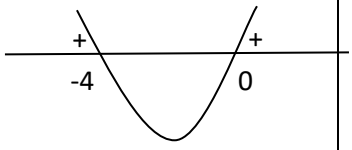
	$x = 3 - 2y$ $(3 - 2y + y)[2(3 - 2y) - y] = 0$ $2(3-2y) + y(3-2y) - y^2 = 0$ $2(9-12y+4y^2) + 3y - 2y^2 - y^2 = 0$ $18 - 24y + 8y + 3y - 2y^2 - y^2 = 0$ $5y - 21y + 18 = 0$ $(5y-6)(y-3) = 0$ $y = \frac{6}{5}$ *or* $y = 3$ $x = \frac{3}{5}$ *or* $x = -3$	✓ $x = 3 - 2y$ ✓sub. of x into quadratic e/ vervang y in kwadratiese vergelyking ✓✓y values / waardes ✓✓x values / waardes (6)

QUESTION 2 / VRAAG 2

2.1	$x^2 + 4x > 0$ $x(x + 4) > 0$ $x < -4$ or $x > 0$ 	✓factors / faktore ✓ $x < -4$ ✓ $x > 0$ (3)
2.2.1	$(x + yi)(2 - i) = 8 + i$ $2x - xi + 2yi - yi^2 = 8 + i$ $2x + y + (-x + 2y)i = 8 + i$ $2x + y = 8$ *and* $-x + 2y = 1$ $y = 8 - 2x$ $-x + 2(8 - 2x) = 1$ $-x + 16 - 4x = 1$ $-5x = -15$ $x = 3$ $y = 2(3) - 8 = -2$	✓$2x - y + (-x + 2y)i$ ✓$2x - y = 8$ ✓$-x + 2y = -1$ ✓ $y = 8 - 2x$ ✓ Substation of y ✓x value ✓y value (7)

2.2.2	$x+yi=\frac{7+i}{2-i}$ $x+yi=\frac{(7+i)(2+i)}{(2-i)(2+i)}$ $=\frac{14+7i+2i+i^2}{4+1}$ $=\frac{13+9i}{5}$ $=\frac{13}{5}+\frac{9}{5}i$ $x=\frac{13}{5}$ *and* $y=\frac{9}{5}$	✓multiply & divide by 2+ *i* ✓ $13+9i$ ✓5 ✓*x* value ✓*y* value (5)
2.3	z = $-1+i$ in polar form $\|\mathbf{z}\| = \sqrt{(-1)^2+1^2} = \sqrt{2}$ $\tan\theta = \frac{1}{-1} = -1$ $argZ = \frac{3\pi}{4}$ $z = \sqrt{2}[\cos(\frac{3\pi}{4}) + i\sin(\frac{3\pi}{4})]$	✓ $\sqrt{2}$ ✓ $\tan\theta = -1$ ✓ $argZ = \frac{3\pi}{4}$ ✓ answer (4)

QUESTION 3 / VRAAG 3

3.1	$x=\frac{5\pm\sqrt{49-8k}}{2}$ $x=\frac{5\pm\sqrt{49-8(5)}}{2}$ $x=\frac{5\pm\sqrt{9}}{2}$ Roots are unequal,rational and real./ *Wortels is ongelyk, rasionaal en reëel*	✓substitution / vervanging ✓ $x=\frac{5\pm\sqrt{9}}{2}$ ✓ answer / antwoord (3)
3.2	Roots are real when / *Wortels is reëel* $\Delta \geq 0$ $49-8k \geq 0$ $-8k \geq -49$ $k \leq \frac{49}{8}$	✓ $\Delta \geq 0$ ✓ $-8k \geq -49$ ✓ answer / antwoord (3)

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QUESTION 4 / VRAAG 4

4.1.1	$\frac{3^{n+4} - 6.3^{n+2}}{3^{n+2}.2}$ $= \frac{3^{n+2}[3^2 - 6.]}{3^{n+2}.2}$ $= \frac{3}{2}$	✓Taking common factor outside ✓ simplification ✓ answer / antwoord (3)
4.1.2	log 15+ log 6 – 2log 3 = log 15+ log 6 – log 3^2 $= \log\frac{15\times 6}{9}$ = log 10 = 1	✓$\log\frac{15\times 6}{9}$ ✓log 10 ✓answer /*antwoord* (3)
4.1.3	$\frac{\log 36 - \log 25}{\log 6 - \log 5}$ $= \frac{\log 6^2 - \log 5^2}{\log 6 - \log 5}$ $= \frac{2[\log 6 - \log 5]}{\log 6 - \log 5}$ = 2	✓$= \frac{\log 6^2 - \log 5^2}{\log 6 - \log 5}$ ✓ Taking 2 outside/ factorising ✓answer / *antwoord* (3)
4.2.1	$4^{x-1} = \sqrt{32}$ $2^{2(x-1)} = 2^{\frac{5}{2}}$ $2(x-1) = \frac{5}{2}$ $x - 1 = \frac{5}{4}$ $x = \frac{9}{4}$	✓changing the base / *verander die grondtal* ✓equating the exponents / *stel eksponente gelyk* ✓answer / *antwoord* (3)

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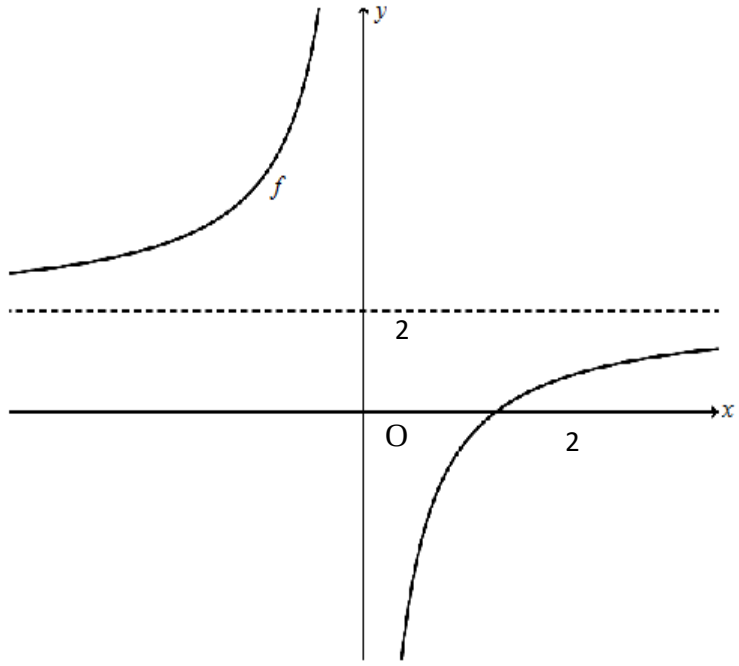
4.2.2	$2.5^x = 6$ $5^x = 3$ $x \log 5 = \log 3$ $x = \frac{\log 3}{\log 5}$ $= 0{,}68$	✓$5^x = 3$ ✓ $x = \frac{\log 3}{\log 5}$ ✓ answer (3)
4.2.3	$\log(x-1) + \log(x+2) - 1 = 0$ $\log(x-1) + \log(x+2) = 1$ $\log(x-1)(x+2) = 1$ $(x-1)(x+2) = 10$ $x^2 + x - 2 = 10$ $x^2 + x - 12 = 0$ $(x-3)(x+4) = 0$ $x = 3$ *or* $x = -4$ N/A	✓ Taking 1 to RHS ✓apply the law ✓ changing log form to exponential form ✓quadratic form ✓factors ✓ answer (6)
4.3	$\log\frac{\sqrt{3}}{3} = \log\sqrt{3} - \log 3$ $= \log 3^{\frac{1}{2}} - \log 3$ $= \frac{1}{2}\log 3 - \log 3$ $= \frac{1}{2}m - m$ $= -\frac{1}{2}m$	✓ apply the law ✓$\frac{1}{2}\log 3 - \log 3$ ✓answer (3)

QUESTION 5

5.1	$y = 2$	✓answer (1)
5.2	$-\frac{4}{x}+2=y$ $-\frac{4}{x}+2=0$ $-\frac{4}{x}=-2$ $-4=-2x$ $x=2$	✓y= 0 ✓$-\frac{4}{x}=-2$ ✓answer / antwoord (3)
5.3	Sketch graph / *Sketsgrafiek*  	✓Asymptote / *Asimptote* ✓*x*-int / *afsnit* ✓shape / *vorm* (3)

QUESTION 6

6.1.1	$g(x)=a^x+q$ q = - 2 g(*x*) = a^x - 2 0 = a^1 - 2 2 = a^1 a = 2	✓ q = -2 ✓sub of (1;0) / verv (1;0) ✓ 2 = a^1 ✓ans / antw (3)
6.1.2	y > – 2 OR $y \in (-1;\infty)$	✓answer / antwoord (1)
6.1.3	y = 0	✓✓answer / antwoord (2)
6.2.1	*r* = 7	✓answer (1)
6.2.2	$-7 \leq y \leq 7$	✓end points ✓Notation (2)

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QUESTION 7

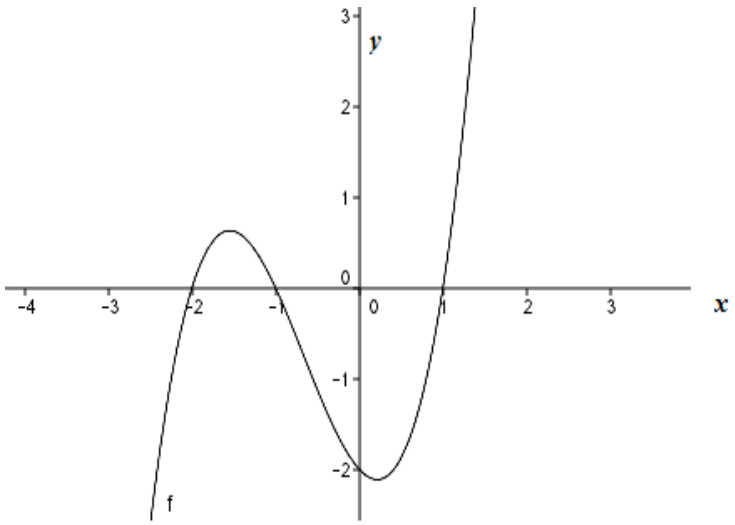
7.1	$x = 5$ or $x = -1$ OA = 1 OB = 5	✓✓answers (2)
7.2	$y = 2(0+1)(0-5)$ y = - 10 units C(0 ; -10)	✓x =0 ✓ answer (2)
7.3	$x = \frac{-b}{2a}$ $= \frac{-(-8)}{2(2)}$ = 2 y = 2 $(2)^2$ – 8(2) – 10 = – 18 Max . length =18	✓substitution / vervang ✓ x = 2 ✓ y value / waarde ✓ answer (4)
7.4	$y \geq -18$	✓answer (1)
7.5	$0 < x < 5$	✓ end values ✓Notation (2)
7.6	m = $\frac{0+10}{5-0} = 2$ C = -10	✓ value of m ✓ value of c (2)
7.7	(2 ; 18)	✓ x value ✓y value (2)

QUESTION 8

8.1	$f(x) = 3x + 6$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $\therefore f'(x) = \lim_{h\to 0} \frac{3(x+h) + 6 - (3x+6)}{h}$ $\therefore f'(x) = \lim_{h\to 0} \frac{3x + 3h + 6 - 3x - 6}{h}$ $\therefore f'(x) = \lim_{h\to 0} \frac{3h}{h}$ $\therefore f'(x) = \lim_{h\to 0} 3$ $\therefore f'(x) = 3$	✓ formula ✓correct substitution ✓ simplification ✓ $\lim_{h\to 0} 3$ ✓answer (5)

8.2.1	$g(x) = -5 + 2x - 6x^2$	✓ -5 ✓ $2x$ ✓$-6x^2$ (3)
8.2.2	$y = \frac{7}{\sqrt{x}} - \frac{x^2}{4}$ $y = 7x^{\frac{-1}{2}} - \frac{x^2}{4}$ $\frac{dy}{dx} = -\frac{7}{2}x^{-\frac{3}{2}} - \frac{2}{4}x$	✓ $y = 7x^{\frac{-1}{2}} - \frac{x^2}{4}$ ✓ $-\frac{1}{2}x$ ✓ $-\frac{7}{2}x^{-\frac{3}{2}}$ (3)
8.3	$Dx\left[\frac{4x+5}{2x^2}\right]$ $Dx\left[\frac{4x}{2x^2} + \frac{5}{2x^2}\right]$ $Dx\left[2x^{-1} + \frac{5}{2}x^{-2}\right]$ $= -2x^{-2} + 5x^{-3}$	✓ $Dx\left[\frac{4x}{2x^2} + \frac{5}{2x^2}\right]$ ✓ $Dx\left[2x^{-1} + \frac{5}{2}x^{-2}\right]$ ✓✓ $= -2x^{-2} + 5x^{-3}$ (4)
8.4.1	$\int (2x^2 - 1)dx = \frac{2x^3}{3} - x + c$	✓ $\frac{2x^3}{3}$ ✓$-x$ ✓ c (3)
8.4.2	$\int_{-1}^{2} (x^3 - 4x^2 + 3x)\,dx = \left[\frac{x^4}{4} - \frac{4x^3}{3} + \frac{3x^2}{2}\right]_{-1}^{2}$ $= \left[\frac{(2)^4}{4} - \frac{4(2)^3}{3} + \frac{3(2)^2}{2}\right] - \left[\frac{(-1)^4}{4} - \frac{4(-1)^3}{3} + \frac{3(-1)^2}{2}\right]$ $= \frac{-13}{12}$	✓ $\left[\frac{x^4}{4} - \frac{4x^3}{3} + \frac{3x^2}{2}\right]_{-1}^{2}$ ✓ sub. of 2 ✓sub. of -1 ✓answer (4)

QUESTION 9

9.1	$g(1) = (1)^3 + 2(1)^2 - (1) - 2$ $= 0$ $(x - 1)$ is a factor of $g(x)$	✓substitution of 1 ✓ g(1) =0
9.2	1 1 2 -1 -2 1 3 2 1 3 2 0 $g(x) = (x-1)(x^2 + 3x + 2)$ $= (x-1)(x+2)(x+1)$ x- intercepts are $x = 1$; $x = -2$ and $x = -1$	✓ $x^2 + 3x + 2$ ✓ $x = 1$ ✓ $x = -2$ ✓ $x = -1$ (4)
9.3	$g'(x) = 3x^2 + 4x - 1$ $3x^2 + 4x - 1 = 0$ $x = \frac{-4 \pm \sqrt{4^2 - 4(3)(-1)}}{2(3)}$ $x = 0,22 \quad or \quad x = -1,5$ TP(0,22; - 2,11) and (-1,5; 0,63)	✓ $g'(x) = 3x^2 + 4x - 1$ ✓ $3x^2 + 4x - 1 = 0$ ✓ two x values ✓✓ Turning points (5)
9.4		✓ shape(+ graph) ✓ all 3 x-int ✓y- int ✓correct T.P (4)
9.5	k > 0,63 **or** k < -2,11	✓ k > 0,63 ✓ k < -2,11 (2)

QUESTION 10

10.1	$\text{SR} = x + 30$ $\text{EH} = \frac{5\,400}{x}$ $\text{PS} = \frac{5\,400}{x} + 20$	✓ SR ✓EH ✓ PS (3)
10.2	$\text{Area PQRS} = (x+30)\left(\frac{5\,400}{x} + 20\right)$ $\therefore \text{ Area PQRS} = 5\,400 + 20x + \frac{162\,000}{x} + 600$ $\therefore \text{ Area PQRS} = 6\,000 + 20x + 162\,000x^{-1}$	✓$= (x+30)\left(\frac{5\,400}{x} + 20\right)$ ✓ simplification (2)
10.3	$A' = 20 - 162\,000x^{-2} = 0$ $20 - 162\,000x^{-2} = 0$ $\therefore 20 = \frac{162\,000}{x^2}$ $\therefore 20x^2 = 162\,000$ $\therefore x^2 = 8100$ $\therefore x = 90$ $\therefore \text{SR} = 90 + 30 = 120\,\text{mm}$	✓ $A' = 20 - 162\,000x^{-2} = 0$ ✓$\therefore 20 = \frac{162\,000}{x^2}$ ✓$\therefore x^2 = 8100$ ✓x = 90 ✓ 120 (5)

QUESTION 11

11.1	A = $P(1 - i)^n$ $2000 = 10000(1 - i)^{10}$ $1 - i = \sqrt[5]{\frac{2000}{10000}}$ = 0, 7247796637 i = 0,2752203363 r = 27,5%	✓Sub into correct formula ✓$1 - i = \sqrt[5]{\frac{2000}{10000}}$ ✓= 0,2752203363 ✓answer (4)
11.2	$A = 120000(1 + \frac{0,0875}{12})^{24}(1 + \frac{0,1025}{4})^{16}$ = R 214153,22	✓ $(1 + \frac{0,0875}{12})^{24}$ ✓ $(1 + \frac{0,1025}{4})^{16}$ ✓ 120000 ✓ $A = 120000(1 + \frac{0,0875}{12})^{24}(1 + \frac{0,1025}{4})^{16}$ ✓ R 214153,22 (5)