education

MPUMALANGA PROVINCE

REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1

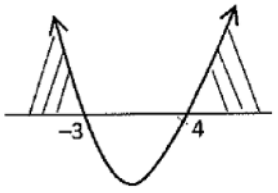
JUNE 2023

MARKING GUIDELINES

This marking guideline consists of 12 pages.

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QUESTION 1

1.1.1	$(x-2)(-x+4)=0$ $x-2=0 \quad or \quad -x+4=0$ $x=2 \quad or \quad x=4$	✓ $x=2$ ✓ $x=4$	(2)
1.1.2	$3x^2=2x+4$ $3x^2-2x-4=0$ $x=\dfrac{-(-2)\pm\sqrt{(-2)^2-4(3)(-4)}}{2(3)}$ $x=\dfrac{2\pm\sqrt{52}}{6}$ $x=-0{,}87 \quad or \quad x=1{,}54$	✓standard form ✓substitution in correct ✓✓values of x	(4)
1.1.3	$x-2\sqrt{x-1}=4$ $-2\sqrt{x-1}=4-x$ $\left(-2\sqrt{x-1}\right)^2=(4-x)^2$ $4x-4=16-8x+x^2$ $x^2-12x+20=0$ $(x-10)(x-2)=0$ $x=10 \quad or \quad x\neq 2$	✓isolate the surd ✓square both sides ✓standard form ✓factors ✓x-values ✓ $x=10$ only	(6)
1.1.4	$x^2-x-12>0$ $(x-4)(x+3)>0$  **OR**  $x<-3 \quad or \quad x>4$	✓standard f ✓factors ✓critical values ✓solution	(4)

1.2	$x+2y=1$ $x=1-2y$ $(1-2y)^2-y(1-2y)-5y^2=-5$ $1-4y+4y^2-y+2y^2-5y^2=-5$ $y^2-5y+6=0$ $(y-3)(y-2)=0$ $y=3$ *or* $y=2$ $x=1-2(3)$ *or* $x=1-2(2)$ $x=-5$ *or* $x=-3$	✓subject of formulae ✓substitution ✓standard form ✓factors ✓ $y=3$ *or* $y=2$ ✓ $x=-5$ *or* $x=-3$	(6)
1.3	$5^x>0$ $\therefore 2-t>0$ $\therefore t<2$	✓condition ✓ $2-t>0$ ✓ $t<2$	(3)
			[25]

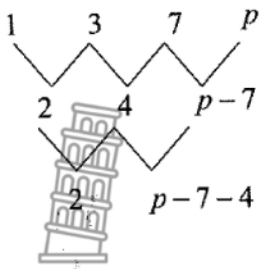
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QUESTION 2

2.1	18	✓answer	(1)
2.2	$T_n = 5n - 2$ $T_{253} = 5(253) - 2$ $T_{253} = 1263$	✓nth term ✓substitution ✓answer	(3)
2.3	$\sum_{n=1}^{253}(5n-2)$	✓limits ✓ $5n-2$	(2)
2.4	$S_{253} = \frac{253}{2}[3+1263]$ $S_{253} = 160149$ **OR** $S_{253} = \frac{253}{2}[2(3)+(253-1)5]$ $S_{253} = 160149$	✓substitution ✓answer ✓substitution ✓answer	(2)
2.5	$8 + 28 + 48 + \ldots + 1248$ $a = 8,\ d = 20$ $T_n = 20n - 12$ $20n - 12 = 1248$ $n = 63$	✓terms divisible by 4 ✓general term ✓equating ✓value of n.	(4)
			[12]

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QUESTION 3

3.1.1	 $p-7-4=2$ $p=13$	✓first differences ✓equating ✓$p=13$	(3)
3.1.2	$2a=2$ $\quad 3a+b=2$ $\quad a+b+c=1$ $a=1$ $\quad 3(1)+b=2$ $\quad 1-1+c=1$ $b=-1$ $\quad c=1$ $T_n=n^2-n+1$	✓$a=1$ ✓$b=-1$ ✓$c=1$ ✓$T_n=n^2-n+1$	(4)
3.1.3	2 , 4 , 6… $a=2 \quad d=2$ $T_n=2n$ $2n=62$ $n=31$ Term number 31 and term number 32	✓general term ✓equating ✓both 31 and 32	(3)
3.2	$\sum_{k=-2}^{m} 2.2^{k+2} < 2046$ $2.2^0+2.2^1+2.2^2+2.2^3+\ldots+2.2^{m+2}<2046$ $2+4+8+16+\ldots+$ $a=2, \quad r=2, \quad n=m-(-2)+1$ $=m+3$ $\therefore \frac{2(2^{m+3}-1)}{2-1}<2046$ $2^{m+3}-1<1023$ $2^{m+3}<1024$ $2^{m+3}<2^{10}$ $m+3<10$ $m<7$ $\therefore m=6$	✓expansion ✓a, r and n ✓substitution into correct formulae ✓$m<7$ ✓$m=6$	(5)
			[15]

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QUESTION 4

4.1.1	$\frac{-2+x}{2}=1$ $x=4$ B(4;0) Answer only full marks	✓method ✓$x=4$	(2)
4.1.2	$y=1(x-(-2))(x-4)$ $y=x^2-2x-8$	✓method ✓correct equation	(2)
4.1.3	C(0;−8) $a=\frac{-8-0}{0-4}$ $a=\frac{8}{4}=2$ $g(x)=2x-8$ $a=2$ $q=-8$	✓ C(0;−8) ✓substitution ✓ $a=2$ ✓ $q=-8$	(4)
4.1.4	$y=(1)^2-2(1)-8$ $y=-9$ (1;−9)	✓value of y ✓ (1;−9)	(2)
4.2	$\frac{0+x}{2}=1$ $x=2$ M(2;−8)	✓$x=2$ ✓ M(2;−8)	(2)
4.3	$x<0$ *or* $x>4$	✓$x<0$ ✓$x>4$	(2)
4.4	(3 ; 9)	✓$x=3$ ✓$y=9$	(2)
4.5	$TP=2x-8-(x^2-2x-8)$ $TP=-x^2+4x$ $TP'=-2x+4$ $-2x+4=0$ $x=2$ $TP=-(2)^2+4(2)$ $TP=4$	✓top function –bottom function ✓derivative ✓equating to 0 ✓answer	

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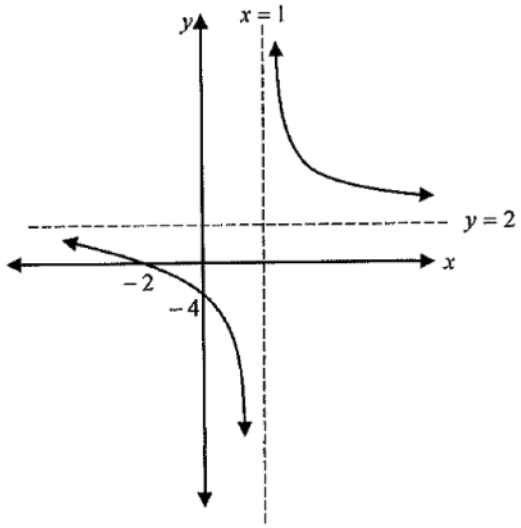
	OR Completing the square $-(x^2-4x)$ $=-[(x-2)^2-4]$ $=-(x-2)^2+4$ There is a maximum of 4 when $x=2$	✓factoring a negative ✓completing the square ✓✓maximum 4 when $x=2$	(4)
			[20]

QUESTION 5

5.1	$x>0$ **OR** $x\in(0;\infty)$	✓domain	(1)
5.2	$y=-\log_3 x$ $y=\log_3 x^{-1}$ $x=\log_3 y^{-1}$ $3^x=y^{-1}$ $y=\left(\frac{1}{3}\right)^x$ or $y=3^{-x}$ Answer only full marks	✓interchanging x and y ✓correct equation	(2)
5.3	f is shifted 5 units vertically down	✓5 units ✓down	(2)
5.4	$\log_3 x=3$ $x=3^3$ $x=27$ $\therefore -\log_3 x\geq -3$ $0<x\leq 27$	✓$x=27$ ✓$-\log_3 x\geq -3$ ✓✓$0<x\leq 27$	(4)
			[9]

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QUESTION 6

6.1	$q = 2$	✓*answer*	(1)
6.2	$y = x + p + 2$ $\therefore p + 2 = 1$ $p = -1$ $\therefore y = \frac{a}{x-1} + 2$ $-4 = \frac{a}{0-1} + 2$ $a = 6$ OR $y = x + 1$ $2 = x + 1$ $x = 1$	✓$p + 2$ ✓$p = -1$ ✓sub (0;-4) ✓$a = 6$	(4)
6.3	$y = \frac{6}{x-1} + 2$ $0 = \frac{6}{x-1} + 2$ $x = -2$ $(-2;0)$  	✓$x = -2$ ✓x intercept ✓y intercept ✓asymptote ✓shape of graph	(5)
			[10]

QUESTION 7

7.1	$1+i_{eff}=\left(1+\frac{0.104}{12}\right)^{12}$ $i_{eff}=1,109103376-1$ $i_{eff}=10,91\%$	✓$n=12$ ✓$i=\frac{0,104}{12}$ ✓substitution into the correct formula ✓10,91%	(4)
7.2	$0,5P=P(1-i)^4$ $0,5=(1-i)^4$ $\sqrt[4]{0,5}=1-i$ $i=1-\sqrt[4]{0,5}$ $i=0,1591$ $i=15,91\%$	✓subs in correct formula ✓divide by P ✓4th root ✓i=15,91%	(4)
7.3.1	Loan with interest to date $=80000(1+0,21)^5$ $=R207499,40$	✓subs in correct formula ✓R20 7499,40	(2)
7.3.2	Repayments with interest to date $=25000(1+0,21)^3+55000(1+0,21)^1$ $=R101673,20$ Outstanding balance =Loan with interest to date- Repayments with interest to date =R207499,40 - R10 673,20 =R105826,20	✓$25000(1+0,21)^3$ ✓$55000(1+0,21)^1$ ✓R101673,20 ✓method ✓105826,20	(5)
			[15]

QUESTION 8

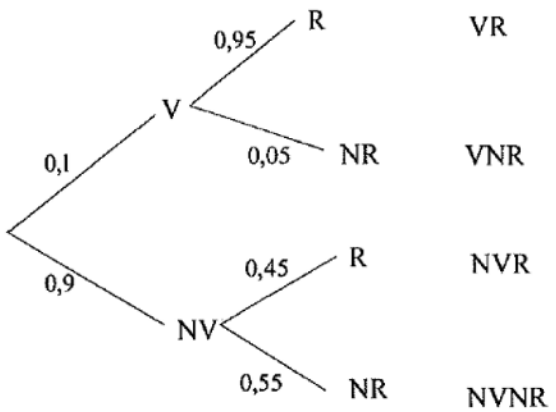
8.1	$f(x+h)=4(x+h)-2(x+h)^2$ $=4x+4h-2x^2-4xh-2h^2$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $f'(x)=\lim_{h\to 0}\frac{4x+4h-2x^2-4xh-2h^2-\left(4x-2x^2\right)}{h}$ $f'(x)=\lim_{h\to 0}\frac{4h-4xh-2h^2}{h}$ $f'(x)=\lim_{h\to 0}\frac{h(4-4x-2h)}{h}$ $f'(x)=4-4x$	✓ $f(x+h)$ ✓subt. into correct formula ✓ $4h-4xh-2h^2$ ✓factoring h ✓answer	(5)
8.2.1	$D_x\left[x^4-x^{-2}\right]$ $=4x^3+2x^{-1}$	✓ x^{-2} ✓ $4x^3$ ✓ $2x^{-1}$	(3)
8.2.2	$\sqrt{y}=\frac{x^2}{x}-\frac{4x}{x}$ $\sqrt{y}=x-4$ $y=(x-4)^2$ $y=x^2-8x+16$ $\frac{dy}{dx}=2x-8$	✓dividing by x ✓squaring ✓✓answer	(4)
8.3	$m=36$ $f'(x)=3x^2-12x$ $3x^2-12x=36$ $3x^2-12x-36=0$ $(x-6)(x+2)=0$ $x\neq 6$ *or* $x=-2$ $f(-2)=(-2)^3-6(-2)^2$ $f(-2)=-32$ $y-(-32)=36(x-(-2))$ $y=36x+40$	✓ $f'(x)=36$ ✓factors ✓ $x=-2$ ✓ $y=-32$ ✓equation	(5)
			[17]

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QUESTION 9

9.1	C (2 ; 0)	✓ answer	(1)
9.2	$0 = a(-1)^3 + c(-1) + 2$ $a + c = 2$ $c = 2 - a$ $0 = a(2)^3 + c(2) + 2$ $c + 4a = -1$ $2 - a + 4a = -1$ $3a = -3$ $a = -1$ $c = 2 - (-1)$ $c = 3$	✓substitute (–1 ; 0) ✓subject of formula ✓substitute (2 ; 0) ✓sub in second equation	(4)
9.3	$f'(x) = -3x^2 + 3$ $0 = -3x^2 + 3$ $0 = -3(x-1)(x+1)$ $x = 1$ $f(1) = -(1)^3 + 3(1) + 2$ $= 4$ B(1 : 4)	✓equating derivative to zero ✓x-value ✓y-value	(3)
9.4	$\frac{-1+1}{2} = 0$ OR $f'(x) = -3x^2 + 3$ $f''(x) = -6x$ $-6x = 0$ $x = 0$	✓method ✓answer	(2)
9.5	$k < 0$ *or* $k > 4$	✓$k < 0$ ✓k > 4	(2)
9.6	$x < -1$ *or* $x > 1$	✓both critical values ✓ $x < -1$ *or* $x > 1$	(2)
			[14]

QUESTION 10

10.1.1	$P(B) = 0,1 + 0,4$ $= 0,5$ $P(A) \times P(B) = 0,1$ $(x + 0,1)(0,5) = 0,1$ $x = 0,1$ $y = 1 - 0,1$ $y = 0.9$	✓ $P(B) = 0,5$ ✓ $P(A) \times P(B) = 0,1$ ✓ $x = 0,1$ ✓ $y = 0,9$	(4)
10.1.2	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $= 0,2 + 0,5 - 0,1$ $= 0,6$	✓ formulae ✓ $P(A) = 0,2$ ✓ answer	(3)
10.2.1		✓ $0,1 \times 0,95$ ✓ $0,1 \times 0,05$ ✓ non violent	(3)
10.2.2	P(Violent crime rep) or P(Non -violent crime rep) $= 0,1 \times 0,95 + 0,9 \times 0,45$ $= 0,5$	✓ $0,1 \times 0,95$ ✓ $0,9 \times 0,45$ ✓ answer	(3)
			[13]

TOTAL MARKS: 150

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