Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD 12*

SEPTEMBER 2018

MATHEMATICS P1/*WISKUNDE V1* MARKING GUIDELINE/*NASIENRIGLYN*

MARKS/*PUNTE*: **150**

This marking guideline consists of 12 pages./
Hierdie nasienriglyn bestaan uit 12 bladsye.

NOTE/*LET WEL*:

- If a candidate answers a question TWICE, mark the FIRST attempt ONLY.
  Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk SLEGS die EERSTE poging.
- Consistent accuracy applies in ALL aspects of the marking guideline.
  Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die nasienriglyn.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
  Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.
- The mark for substitution is awarded for substitution into the correct formula.
  Die punt vir substitusie word toegeken vir substitusie in die korrekte formule.

QUESTION 1/*VRAAG 1*

1.1.1	$\frac{1}{2}x^2 - x - 4 = 0$ $x^2 - 2x - 8 = 0$ $(x-4)(x+2) = 0$ $x = 4$ or/*of* $x = -2$	✓✓ factors/*faktore* ✓ x-values/*waardes* (3)
1.1.2	$-3(x^2+3x)+7=0$ $-3x^2 - 9x + 7 = 0$ $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $x = \frac{-(-9) \pm \sqrt{(-9)^2-4(1)(7)}}{2(-3)}$ $x = 0{,}64$ or/*of* $x = -3{,}64$	✓ standard form/*standaardvorm* ✓ substitution/*substitusie* ✓✓ x-values/*waardes* (4)
1.1.3	$2x^2 - 3x < 0$ $x(2x-3) < 0$ + | − | + 0 $\frac{3}{2}$ $0 < x < \frac{3}{2}$	✓ $x(2x-3)$ ✓ critical values/*kritiese waardes* ✓ ✓ $0 < x < \frac{3}{2}$ (4)

1.2	$x - 2y = 3$ ……..(1) $4x^2 - 3 = -6y + 5xy$…….(2) from (1)/*vanaf* (1) $x = 2y + 3$ sub into (2)/*vervang in* (2) $2(2y + 3)^2 - 3 = -6y + 5y(2y + 3)$ $4(4y^2 + 12y + 9) - 3 = -6y + 10y^2 + 15y$ $16y^2 + 48y + 36 - 3 = 10y^2 + 9y$ $6y^2 + 39y + 33 = 0$ $2y^2 + 13y + 11 = 0$ $(y + 1)(2y + 11) = 0$ $y = -1$ or $y = -\frac{11}{2}$ $x = 1$ or/*of* $x = -8$	✓ $x = 2y + 3$ ✓ substitution/*vervanging* ✓ standard form/*standaardvorm* ✓ factors/*faktore* ✓ y-values /*y-waardes* ✓ x-values/x-*waardes* (6)
1.3	$2x^2 - (k - 1)x + k - 3 = 0$ $\Delta = b^2 - 4ac$ $\Delta = [-(k - 1)]^2 - 4(2)(k - 3)$ $\Delta = k^2 - 2k + 1 - 8k + 24$ $\Delta = k^2 - 10k + 25$ $\Delta = (k - 5)^2$ $(k - 5)^2 \geq 0$ ∴ Roots are Real/$Wortels\ is\ Reël$	✓ $\Delta = [-(k - 1)]^2 - 4(2)(k - 3)$ ✓ $\Delta = k^2 - 2k + 1 - 8k + 24$ ✓ $\Delta = k^2 - 10k + 25$ ✓ $\Delta = (k - 5)^2$ ✓ $(k - 5)^2 \geq 0$ (5)
1.4.1	$3^{2m} = \frac{3p}{3-p}$ $3^{2m} = \frac{3(1{,}5)}{3 - 1{,}5}$ $3^{2m} = 3$ ∴ $2m = 1$ ∴ $m = \frac{1}{2}$	✓ sub. of/*vervanging van* $p = 1{,}5$ ✓ answer/*antwoord* (2)
1.4.2	$3^{2m} = \frac{3p}{3 - p}$ $3^{2(0)} = \frac{3p}{3 - p}$ $1 = \frac{3p}{3 - p}$ $3p = 3 - p$ $4p = 3$ ∴ $p = \frac{3}{4}$	✓ sub. of/*vervanging van* $m = 0$ ✓ answer/*antwoord* (2) **[26]**

QUESTION 2/*VRAAG 2*

2.1	$\frac{2x+2}{7x+1}=\frac{x-1}{2x+2}$ $(2x+2)^2=(7x+1)(x-1)$ $4x^2+8x+4=7x^2-6x-1$ $3x^2-14x-5=0$ $(3x+1)(x-5)=0$ $x=-\frac{1}{3}$ or/*of* $x=5$	✓ $\frac{T_2}{T_1}=\frac{T_3}{T_2}$ ✓ standard form/*standaardvorm* ✓ factors/ *faktore* ✓ $x=-\frac{1}{3}$ ✓ $x=5$ (5)
2.2	25 ; 20 ; 16; .... $a=25$; $r=\frac{4}{5}$ $S_\infty=\frac{a}{1-r}$ $S_\infty=\frac{25}{1-\frac{4}{5}}$ $S_\infty=125m$	✓ $r=\frac{4}{5}$ ✓ $S_\infty=\frac{a}{1-r}$ ✓ substitution/*vervanging* ✓$S_\infty=125\,m$ (4)
2.3	$a=2$ $l=29$ $S_n=155$ $S_n=\frac{n}{2}(a+l)$ $155=\frac{n}{2}(2+29)$ $n=10$ $29=2+(10-1)d$ $9d=27$ $d=3$	✓ sum formula of AS/ *som formule van RR* ✓sub./*vervanging van* a and/*en* l ✓$n=10$ ✓ sub./*vervanging van* $n=10$ ✓ $d=3$ (5) **[14]**

QUESTION 3/*VRAAG 3*

3.	$2a=4$ $a=2$ $24=2+b+c$ .....(1) $24=50+5b+c$ .....(2) $4b=-48$ (2) – (1) $b=-12$ $24=2-12+c$ $c=34$ $T_n=2n^2-12n+34$ See alternative answers/ *Kyk na alternatiewe antwoorde*	✓ $2a=4$ ✓ $a=2$ ✓sub. into /*vervang in* T_1 ✓sub. into /*vervang in* T_5 ✓method of solving/*metode van oplossing* ✓ $b=-12$ ✓ sub. of /vervanging *van b* ✓ $c=34$ (8) **[8]**

QUESTION 4/*VRAAG 4*

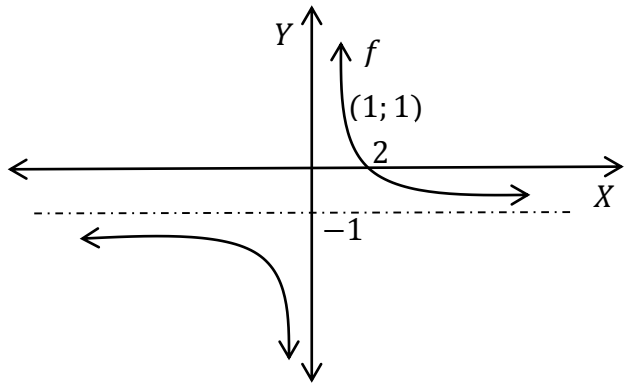
4.1	$36 = k^2$ $\therefore k = 6$	✓ sub of point/*vervanging van punt* ✓ $k = 6$ (2)
4.2	$y = 6^x$ $x = 6^y$ $y = \log_6 x$	✓ swop of x and y. / *omruiling van x en y*. ✓ $y = \log_6 x$ (2)
4.3	$0 < x \leq 1$	✓✓ answer/*antwoord* (2)
4.4	$y > 2$	✓✓ answer/*antwoord* (2) **[8]**

QUESTION 5/*VRAAG 5*

5.1	$B(5; 0)$	✓✓ answer /*antwoord* (2)
5.2	$y = a(x-p)^2 + q$ $y = a\left(x - \frac{3}{2}\right)^2 + \frac{49}{4}$ $0 = a\left(5 - \frac{3}{2}\right)^2 + \frac{49}{4}$ $a = -1$ $y = -1\left(x - \frac{3}{2}\right)^2 + \frac{49}{4}$ $y = -1\left(x^2 - 3x + \frac{9}{4}\right) + \frac{49}{4}$ $y = -x^2 + 3x + 10$ **OR/*OF*** $y = a(x-5)(x+2)$ Inspection/ *Inspeksie* $\frac{49}{4} = a(\frac{3}{2} - 5)(\frac{3}{2} + 2)$ $a = -1$ $y = -1(x-5)(x+2)$ $y = -x^2 + 3x + 10$	✓ sub of turning point/ *vervanging van draaipunt* ✓ sub of point B/ *vervanging van punt B* ✓ $a = -1$ ✓$y = -x^2 + 3x + 10$ (4) ✓ sub of x-intercepts/ *vervanging van x-afsnitte* ✓sub of turning point/ *vervanging van draaipunt* ✓ $a = -1$ ✓$y = -x^2 + 3x + 10$ (4)

5.3	$-x^2+3x+10=-x+5$ $x^2-4x-5=0$ $(x-5)(x+1)=0$ $x=5$ or/*of* $x=-1$ $S(-1;6)$	✓$f(x)=g(x)$ ✓ standard form/ *standaardvorm* ✓ factors/*faktore* ✓$S(-1;6)$ (4)
5.4.1	$-1\leq x\leq 5$	✓✓ answer/*antwoord* (2)
5.4.2	$-x^2+3x-2{,}25<0$ $-x^2+3x+10<2{,}25+10$ $\therefore\ f(x)<12{,}25$ $x\in R\ ;x\neq 1{,}5$	✓ $f(x)<12{,}25$ ✓✓ $x\in R\ ;x\neq 1{,}5$ accuracy/*akkuraatheid* (3) **[15]**

QUESTION 6/*VRAAG 6*

6.1		✓ asymptote/*asimptoot* ✓ x-intercept/x-*afsnit* ✓ shape/*vorm* ✓ other point/*ander punt* (4)
6.2	$f(x)=2x^{-1}-1$ $f'(x)=-2x^{-2}$	✓ $f'(x)=-2x^{-2}-1$ ✓ $f'(x)=-2x^{-2}$ (2)
6.3	$h(x)=-x-1$	✓✓ answer/*antwoord* (2)

6.4	$f'(x) = -\frac{2}{x^2}$ and/*en* $h(x) = -x - 1$ $-\frac{2}{x^2} = -1$ $x^2 = 2$ $x = \sqrt{2}$; $x > 0$ $f(\sqrt{2}) = \frac{2}{\sqrt{2}} - 1$ Equation of tangent/*vergelyking van raaklyn:* $y = -x + c$ $\frac{2}{\sqrt{2}} - 1 = -\sqrt{2} + c$ $c = -1 + 2\sqrt{2}$ $\therefore k = 2\sqrt{2}$	✓ setting up of equation/ *opstel van vergelyking* ✓ $x = \sqrt{2}$ ✓ $\frac{2}{\sqrt{2}} - 1$ ✓sub of $(\sqrt{2}; \frac{2}{\sqrt{2}} - 1)$/ *vervanging van* $(\sqrt{2}; \frac{2}{\sqrt{2}} - 1)$ ✓ $k = 2\sqrt{2}$ (5) **[13]**

QUESTION 7/*VRAAG 7*

7.1	$2000\left(1 + \frac{8}{1200}\right)^{12} = 2000\left(1 + \frac{r}{200}\right)^2$ $\sqrt{\left(1 + \frac{8}{1200}\right)^{12}} = \left(1 + \frac{r}{200}\right)$ $r = 8{,}13\%$	✓ $\frac{8}{1200}$ and/*en* $\frac{r}{200}$ ✓ $n = 12$ and/*en* $n = 2$ ✓ $r = 8{,}13\%$ (3)
7.2	$A = P(1-i)^n$ $4\,500 = 9\,500(1 - 7{,}7\%)^n$ $n = \frac{\log\frac{4500}{9500}}{\log(1 - 7{,}7\%)}$ $n \approx 9{,}325$ It will take 10 years/*Dit sal 10 jaar neem.*	✓ correct formula/*korrekte formule* ✓ sub. of A and P/ *vervanging van* A en P ✓ use of logs/*gebruik van logs* ✓$n \approx 9{,}325$ ✓ 10 years/*10 jaar* (5)
7.3.1	$\frac{75}{100} \times 170\,500 = R127\,875$ **OR/ *OF*** $\frac{25}{100} \times 170\,500 = 42\,625$ Loan/*lening* $= 170\,500 - 42\,625$ Loan/*lening* = R127 875	✓✓ answer/*antwoord* (2) **OR/*OF*** ✓ R 42 625 ✓ answer/*antwoord* (2)
7.3.2	$127\,875 = \frac{x\left[1 - \left(1 + \frac{13{,}2}{1200}\right)^{-60}\right]}{\frac{13.2}{1200}}$ $x = R\,2\,922{,}66$	✓ $\frac{13.2}{1200}$ ✓ $n = 60$ ✓ sub of *i*, *n* and 127 875 into correct formula/ *vervanging van i , n en* 127 875 *in die korrekte formule* ✓✓ answer/*antwoord* (5) **[15]**

QUESTION 8/*VRAAG 8*

8.1	$f(x) = x - 2x^2$ $f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0}\frac{(x+h)-2(x+h)^2\ -(x-2x^2)}{h}$ $= \lim_{h\to 0}\frac{(x+h)-2(x^2+2xh+h^2)\ \ -x+2x^2}{h}$ $= \lim_{h\to 0}\frac{x+h-2x^2-4xh-2h^2-x+2x^2}{h}$ $= \lim_{h\to 0}\frac{-4xh-2h^2+h}{h}$ $= \lim_{h\to 0}\frac{h(-4x-2h+1)}{h}$ $= \lim_{h\to 0}(-4x-2h+1)$ $= -4x+1$ Answer ONLY: 0 marks *SLEGS antwoord: 0 punte* Penalise 1 mark for incorrect use of formula. Must show $f'(x)$. *Penaliseer 1 punt vir verkeerde gebruik van formule. Moet $f'(x)$ toon.*	✓ formula/*formule* ✓ substitution of/*substitusie van* $(x+h)$ ✓ simplification/*vereenvoudiging* ✓ simplification to/ *vereenvoudiging na* $(-4xh-2h^2+h)$ ✓ common factor/*gemene faktor* ✓ answer/*antwoord* (6)
8.2.1	$y = \frac{1}{9}x^{-3} + 9x$ $\frac{dy}{dx} = -\frac{1}{3}x^{-4} + 9$ Penalise 1 mark for incorrect notation. *Penaliseer 1 punt vir verkeerde notasie.*	✓ $-\frac{1}{3}x^{-4}$ ✓ 9 (2)
8.2.2	$y = -\frac{1}{2x\sqrt{x}} + x^3$ $y = -\frac{1}{2x.x^{\frac{1}{2}}} + x^3$ $y = -\frac{1}{2}x^{-\frac{3}{2}} + x^3$ $\frac{dy}{dx} = \frac{3}{4}x^{-\frac{5}{4}} + 3x^2$	✓ $\sqrt{x} = x^{\frac{1}{2}}$ ✓ $-\frac{1}{2}x^{-\frac{3}{2}}$ ✓ $\frac{3}{4}x^{-\frac{5}{4}}$ ✓ $3x^2$ (4) **[12]**

QUESTION 9/*VRAAG 9*

9.1	$h(x) = x^3 - 9x^2 + 23x - 15.$ $h'(x) = 3x^2 - 18x + 23$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-18) \pm \sqrt{(-18)^2 - 4(3)(23)}}{2(3)}$ $x = 4{,}15 \quad \frac{\text{or}}{\text{of}} \quad x = 1{,}85$ $x = 1{,}85$ at C/*by* C	✓ $h'(x) = 3x^2 - 18x + 23$ ✓ sub into formula/ *vervang in formule* ✓ both x values/ *beide x waardes* ✓ $x = 1{,}85$ (4)
9.2	$h(x) = x^3 - 9x^2 + 23x - 15.$ $h(x) = (x-1)(x^2 - 8x + 15)$ $h(x) = (x-1)(x-3)(x-5)$ $\therefore F(5;0)$	✓$(x-1)(x^2 - 8x + 15)$ ✓$(x-1)(x-3)(x-5)$ ✓✓$F(5;0)$ (4)
9.3	$h(x) = x^3 - 9x^2 + 23x - 15.$ $h'(x) = 3x^2 - 18x + 23$ $h''(x) = 6x - 18$ $6x - 18 = 0$ $x = 3$ $\therefore k = 3$ $x = \frac{4{,}15 + 1{,}85}{2}$ $x = \frac{6}{2}$ $x = 3$	✓ $h''(x) = 6x - 18$ ✓ $6x - 18 = 0$ ✓$\therefore k = 3$ (3)
9.4	$h'(x) = 3x^2 - 18x + 23$ $h'(3) = 3(3)^2 - 18(3) + 23$ $h'(3) = -4$ $y = -4x + c$ $0 = -4(3) + c$ $c = 12$ $y = -4x + 12$	✓ $h'(3) = -4$ ✓ sub of point D/ *vervanging van punt* D ✓$y = -4x + 12$ (3) **[14]**

QUESTION 10/*VRAAG 10*

10.1	$P = x\left(50 - \frac{1}{2}x\right) - \left(\frac{1}{4}x^2 + 35x + 25\right)$ $P = 50x - \frac{1}{2}x^2 - \frac{1}{4}x^2 - 35x - 25$ $P = -\frac{3}{4}x^2 + 15x - 25$	✓ $x\left(50 - \frac{1}{2}x\right)$ ✓ subtracting total cost/ *aftrekking van totale koste* (2)
10.2	$\frac{dP}{dx} = -\frac{3}{2}x + 15$ $-\frac{3}{2}x + 15 = 0$ $x = 10$	✓ $\frac{dP}{dx} = -\frac{3}{2}x + 15$ ✓ $-\frac{3}{2}x + 15 = 0$ ✓ $x = 10$ (3)
10.3	$C = \frac{\frac{1}{4}x^2 + 35x + 25}{x}$ $C = \frac{1}{4}x + 35 + 25x^{-1}$ $\frac{dC}{dx} = \frac{1}{4} - 25x^{-2}$ $\frac{1}{4} - 25x^{-2} = 0$ $\frac{25}{x^2} = \frac{1}{4}$ $x^2 = 100$ $x = 10$ ∴ Minimum /*Minimum*	✓ $C = \frac{\frac{1}{4}x^2 + 35x + 25}{x}$ ✓ $C = \frac{1}{4}x + 35 + 25x^{-1}$ ✓ $\frac{dC}{dx} = \frac{1}{4} - 25x^{-2}$ ✓ $\frac{1}{4} - 25x^{-2} = 0$ ✓ $x = 10$ (5) **[10]**

QUESTION 11/*VRAAG 11*

11.1.1	$P(M) = \frac{1200}{1600}$ $P(M) = \frac{3}{4}$ or/of 0,75	✓ answer/*antwoord* (1)
11.1.2	$P(Fail) = \frac{200}{1600}$ $P(Fail) = \frac{1}{8}$	✓ answer/*antwoord* (1)
11.1.3	$P(M) \times P(F) = \frac{3}{4} \times \frac{1}{8}$ $= \frac{3}{32}$ $\frac{3}{32} = \frac{A}{1600}$ $A = 150$	✓ $\frac{3}{4} \times \frac{1}{8}$ ✓ $\frac{3}{32}$ ✓ $\frac{3}{32} = \frac{A}{1600}$ (3)
11.1.4	$B = 1050$ $C = 50$ $D = 350$	✓$B = 1050$ ✓$C = 50$ ✓$D = 350$ (3)
11.1.5	$P(F/F) = \frac{50}{1600}$ $P(F/F) = \frac{1}{32}$	✓ 50 ✓ 1600 (2)
11.2.1	$9! = 362880$	✓✓ answer/*antwoord* (2)
11.2.2	$4! \times 5! \times 6$ $= 17\,280$ OR/*OF* $6! \times 4! = 17280$	✓ $4! \times 5!$ ✓ $\times 6$ ✓ 17280 (3) **[15]**

TOTAL/*TOTAAL:* 150

ALTERNATIVE ANSWERS / ALTERNATIEWE ANTWOORDE

1.1.1	$\frac{1}{2}x^2 - x - 4 = 0$ $\left(\frac{1}{2}x + 1\right)(x - 4) = 0$ $x = -2$ or/*of* $x = 4$ **OR/*OF*** $\frac{1}{2}x^2 - x - 4 = 0$ $\left(\frac{1}{2}x - 2\right)(x + 2) = 0$ $x = 4$ or/*of* $x = -2$ **OR/*OF*** $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4\left(\frac{1}{2}\right)(-4)}}{2\left(\frac{1}{2}\right)}$ $x = 4$ or/*of* $x = -2$	✓✓ factors/*faktore* ✓ x-values/*waardes* (3) ✓✓ factors/*faktore* ✓ x-values/*waardes* (3) ✓✓ sub into formula/ *vervang in formule* ✓ x-values/*waardes*
3.1	$2a = 4$ $a = 2$ $T_3 =$ axis of symmetry /*simmetriese as* $T_n = a(n + p)^2 + q$ $T_n = 2(n + p)^2 + q$ $T_n = 2(n - 3)^2 + q$ $24 = 2(1 - 3)^2 + q$ $q = 16$ $T_n = 2(n - 3)^2 + 16$ $T_n = 2(n^2 - 6n + 9) + 16$ $T_n = 2n^2 - 12n + 34$	✓ $2a = 4$ ✓ $a = 2$ ✓ $T_n = 2(n + p)^2 + q$ ✓ $T_n = 2(n - 3)^2 + q$ ✓ $24 = 2(1 - 3)^2 + q$ ✓ $q = 16$ ✓ $T_n = 2(n^2 - 6n + 9) + 16$ ✓ $T_n = 2n^2 - 12n + 34$ (8)
5.4.2	$-x^2 + 3x - \frac{9}{4} < 0$ $x^2 - 3x + \frac{9}{4} > 0$ $4x^2 - 12x + 9 > 0$ $(2x - 3)(2x - 3) > 0$ $\therefore x \in R\ ; x \neq \frac{3}{2}$	✓ factors/*faktore* ✓✓ answer/*antwoord* (3)