basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NASIONALE SENIOR SERTIFIKAAT

GRAAD 12

WISKUNDE V1

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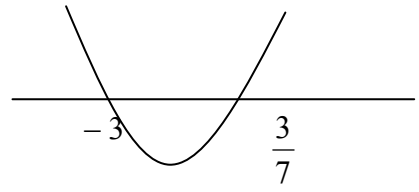
MEMORANDUM

PUNTE: 150

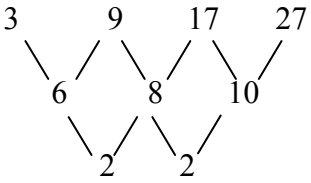
Hierdie memorandum bestaan uit 20 bladsye.

VRAAG 1

1.1.1	$x^2 - x = 12$ $x^2 - x - 12 = 0$ $(x-4)(x+3) = 0$ $x = 4$ or $x = -3$ **OF** $x(x-1) = 12$ $4(3) = 12$ $(-3)(-4) = 12$ Deur inspeksie $x = 4$ or $x = -3$	✓ standaardvorm ✓ faktore ✓ antwoorde (3) ✓ faktore ✓✓ antwoorde (3)
1.1.2	$2x^2 + 3x - 7 = 0$ $x = \dfrac{-3 \pm \sqrt{(3)^2 - 4(2)(-7)}}{2(2)}$ $= \dfrac{-3 \pm \sqrt{65}}{4}$ $x = 1{,}27$ of $x = -2{,}77$	✓ substitusie in korrekte formule ✓ 65 ✓✓ antwoorde (4)
1.1.3	$7x^2 + 18x - 9 > 0$ $(7x-3)(x+3) > 0$ + 0 − 0 + -3 $\frac{3}{7}$  $x < -3$ of $x > \dfrac{3}{7}$ **OF** $x \in (-\infty ; -3) \cup \left(\dfrac{3}{7} ; \infty\right)$	✓ faktore ✓ $\frac{3}{7}$ en -3 ✓✓ korrekte intervalle (4)
1.2	$2x - y = 7$ $y = 2x - 7$ Vervang $y = 2x - 7$ in $x^2 + xy = 21 - y^2$ $x^2 + x(2x-7) = 21 - (2x-7)^2$ $x^2 + 2x^2 - 7x = 21 - 4x^2 + 28x - 49$ $7x^2 - 35x + 28 = 0$ $x^2 - 5x + 4 = 0$ $(x-4)(x-1) = 0$ $x = 4$ of $x = 1$ $y = 1$ of $y = -5$	✓ $y = 2x - 7$ ✓ substitusie ✓ vermenigvuldiging ✓standaardvorm ✓ faktore ✓ x-antwoorde ✓ y-antwoorde (7)

	OF $2x - y = 7$ $x = \frac{7+y}{2}$ Vervang $x = \frac{7+y}{2}$ in $x^2 + xy = 21 - y^2$ $\left(\frac{7+y}{2}\right)^2 + \left(\frac{7+y}{2}\right)y = 21 - y^2$ $\frac{49+14y+y^2}{4} + \frac{7y+y^2}{2} = 21 - y^2$ $49 + 14y + y^2 + 2(7y + y^2) = 84 - 4y^2$ $49 + 14y + y^2 + 14y + 2y^2 = 84 - 4y^2$ $7y^2 + 28y - 35 = 0$ $y^2 + 4y - 5 = 0$ $(y+5)(y-1) = 0$ $y = -5$ of $y = 1$ $x = 1$ $x = 4$	✓ $x = \frac{7+y}{2}$ ✓ substitusie ✓ vermenigvuldiging ✓standaardvorm ✓ faktore ✓ x-antwoorde ✓ y-antwoorde (7)
1.3	$\left(\sqrt[5]{\sqrt{35}+\sqrt{3}}\right)\left(\sqrt[5]{\sqrt{35}-\sqrt{3}}\right)$ $= \sqrt[5]{(\sqrt{35}+\sqrt{3})(\sqrt{35}-\sqrt{3})}$ $= \sqrt[5]{35-3}$ $= \sqrt[5]{32}$ $= 2$	✓ $\sqrt[5]{(\sqrt{35}+\sqrt{3})(\sqrt{35}-\sqrt{3})}$ ✓ $\sqrt[5]{35-3}$ ✓ antwoord (3) **[21]**

VRAAG 2

2.1	39	✓ antwoord (1)
2.2	 Laat $T_n = an^2 + bn + c$ Dan is $2a = 2$ $a = 1$ $3a + b = 6$ $3(1) + b = 6$ $b = 3$ $a + b + c = 3$ $1 + 3 + c = 3$ $c = -1$ $T_n = n^2 + 3n - 1$ **OF** $2a = 2$ $a = 1$ $c = 3 - 4 = -1$ $T_n = n^2 + bn - 1$ $3 = (1)^2 + b(1) - 1$ (as $T_1 = 3$ gebruik) $b = 3$ $T_n = n^2 + 3n - 1$	✓ formule ✓ $a = 1$ ✓ $b = 3$ ✓ $c = -1$ (4) ✓ $a = 1$ ✓ $c = -1$ ✓ formule ✓ $b = 3$ (4)
2.3	$n^2 + 3n - 1 > 269$ $n^2 + 3n - 270 > 0$ $(n + 18)(n - 15) > 0$ Die eerste waarde van n is 16 Die term is $16^2 + 3(16) - 1 = 303$	✓ $n^2 + 3n - 1 > 269$ ✓ faktore ✓ $n = 16$ ✓ antwoord (4) **[9]**

VRAAG 3

3.1	$S_\infty = 8 + \frac{8}{\sqrt{2}} + \ldots$ $r = \frac{1}{\sqrt{2}}$ en $s_\infty = \frac{a}{1-r}$ $= \frac{8}{1-\frac{1}{\sqrt{2}}}$ $= \frac{8\sqrt{2}}{\sqrt{2}-1}$ $= \frac{8\sqrt{2}(\sqrt{2}+1)}{(\sqrt{2}-1)(\sqrt{2}+1)}$ $= 8\sqrt{2}\sqrt{2} + 8\sqrt{2}$ $= 16 + 8\sqrt{2}$ **OF** $S_\infty = 8 + \frac{8}{\sqrt{2}} + \ldots$ $r = \frac{1}{\sqrt{2}}$ en $s_\infty = \frac{a}{1-r}$ $= \frac{8}{1-\frac{1}{\sqrt{2}}}$ $= \frac{8\left(1+\frac{1}{\sqrt{2}}\right)}{\left(1-\frac{1}{\sqrt{2}}\right)\left(1+\frac{1}{\sqrt{2}}\right)}$ $= \frac{8\left(1+\frac{1}{\sqrt{2}}\right)}{\frac{1}{2}}$ $= 16\left(1+\frac{1}{\sqrt{2}}\right)$ $= 16 + \frac{16\sqrt{2}}{2}$ $= 16 + 8\sqrt{2}$	✓ $r = \frac{1}{\sqrt{2}}$ ✓ substitusie ✓ rasionalisering ✓ vereenvoudiging (4) ✓ $r = \frac{1}{\sqrt{2}}$ ✓ substitusie ✓ rasionalisering ✓ vereenvoudiging (4)

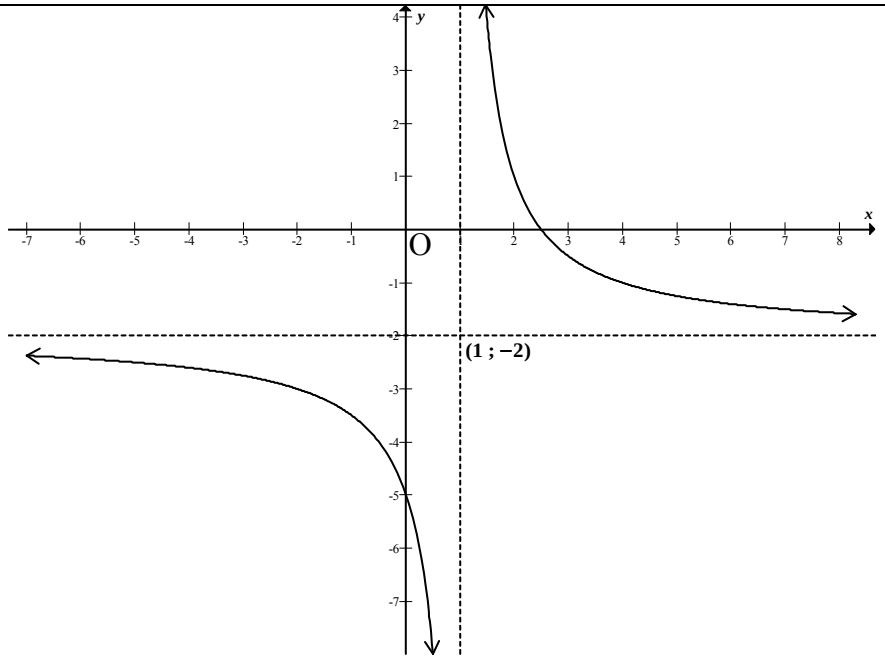
3.2.1	$5 + 15 + 45 + \ldots + T_{20}$ $= \sum_{n=1}^{20} 5(3)^{n-1}$ **OF** $5 + 15 + 45 + \ldots + T_{20}$ $= 5\sum_{n=0}^{19} (3)^{n}$ **OF** $5 + 15 + 45 + \ldots + T_{20}$ $= 5\sum_{i=l}^{l+19} (3)^{i-l}$ vir enige $l \in Z$	✓ ✓antwoord (2) ✓ ✓antwoord (2) ✓ ✓antwoord (2)
3.2.2	$5+15+45+...+T_{20}$ $= \frac{5\left(3^{20}-1\right)}{3-1}$ = 8 716 961 000	✓ formule ✓ substitusie ✓ antwoord (3) **[9]**

VRAAG 4

4.1.1	$S_{23} = \frac{23}{2}(5(23)+9)$ $= 1426$	✓ substitusie ✓ antwoord (2)
4.1.2	$T_{23} = S_{23} - S_{22}$ $= 1426 - \frac{22}{2}(5(22)+9)$ $= 1426 - 1309$ $= 117$	✓ stelling ✓ $S_{22} = 1309$ ✓ antwoord (3)
4.2	Rekenkundige Ry: 12 ; 12 + d ; 12 + 2d Meetkundige Ry: 12 ; 12r ; 12r^2 $12 + d = 12r$ $d = 12r - 12$ $12 + 12r + 12r^2 = 12 + 12 + d + 12 + 2d + 3$ $12r^2 = 12 + 2(12r - 12) + 3$ $12r^2 = 12 + 24r - 24 + 3$ $12r^2 - 24r + 9 = 0$ $4r^2 - 8r + 3 = 0$ $(2r-3)(2r-1) = 0$ $r = \frac{3}{2}$ of $r = \frac{1}{2}$	✓ vergelyking ✓ vergelyking ✓ standaardvorm ✓ faktore ✓ antwoorde (6)

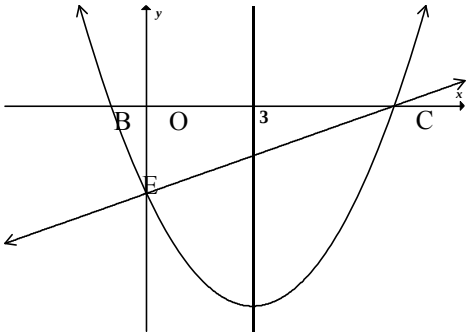
	OF Die 3^{de} term van MR = 3 + 3^{de} term van RR $12r^2 = 3 + 12 + 2d$ $12r^2 = 15 + 24r - 24$ $12r^2 - 24r + 9 = 0$ $4r^2 - 8r + 3 = 0$ $(2r-3)(2r-1) = 0$ $r = \frac{3}{2}$ of $r = \frac{1}{2}$	✓ vergelyking ✓ vergelyking ✓ standaardvorm ✓ faktore ✓ antwoorde **[11]**

VRAAG 5

5.1	$x = 1$ $y = -2$	✓✓ antwoorde (2)
5.2	y-afsnit: $y = \frac{3}{0-1} - 2 = -5$ x-afsnit: $\left(\frac{5}{2}; 0\right)$ $0 = \frac{3}{x-1} - 2$ $2 = \frac{3}{x-1}$ $2x - 2 = 3$ $2x = 5$ $x = \frac{5}{2}$	✓ y = -5 ✓ vervang $y = 0$ ✓ antwoord (3)
5.3		✓ asimptote ✓ y–afsnit ✓ vorm (3)

5.4	$-f(x)=\frac{-3}{x-1}+2$ $y \in R-\{2\}$ OF $y \in (-\infty\,;2)\cup(2\,;\infty)$ OF $y \in R; y \neq 2$	✓ antwoord (1)
5.5	$g(x)=\frac{-3}{x+1}-2$ $=\frac{3}{-x-1}-2$ Refleksie van f in die *y*-as. OF (i) horisontale skuif met 2 eenhede na links, gevolg deur (ii) refleksie in *x*-as, gevolg deur (iii) vertikale afwaartse skuif van 4 eenhede	✓ manipulasie ✓ antwoord (2) **[11]**

VRAAG 6



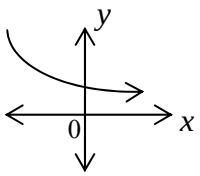
6.1	$\frac{x}{2}-\frac{7}{2}=0$ $x=7$ C(7 ; 0) OF $y=\frac{7}{2}-\frac{7}{2}$ $y=0$ C(7 ; 0)	$\frac{x}{2}-\frac{7}{2}=0$ (1) ✓ substitusie ✓ antwoord (2)
6.2	*x*- koördinaat van B is $3-4=-1$	✓ antwoord (1)

6.3	OPSIE 1 $f(x) = a(x-3)^2 + q$ By B en C: $0 = 16a + q$ By E: $-\frac{7}{2} = 9a + q$ Gelyktydige oplossing gee $a = \frac{1}{2}$ en $q = -8$	✓ substitusie ✓ substitusie ✓ substitusie ✓✓ $a = \frac{1}{2}$ ✓ $q = -8$ (6)
	OPSIE 2 $f(x) = a(x+1)(x-7)$ $y = a(x+1)(x-7)$ $-3{,}5 = a(0+1)(0-7)$ $-3{,}5 = -7a$ $a = \frac{1}{2}$ $f(x) = \frac{1}{2}(x+1)(x-7)$ $= \frac{1}{2}(x^2 - 6x - 7)$ $= \frac{1}{2}\left[(x-3)^2 - 16\right]$ $= \frac{1}{2}(x-3)^2 - 8$	✓ substitudie ✓ substitusie ✓ $a = \frac{1}{2}$ ✓ substitusie ✓ vereeenvoudiging ✓ antwoord (6)
	OPSIE 3 $a = \frac{1}{2}$ As van simmetrie: $x = 3$ of $x = \frac{-1+7}{2} = 3$ $f(x) = \frac{1}{2}(x-3)^2 + q$ $0 = \frac{1}{2}(7-3)^2 + q$ $q = -8$ $y = \frac{1}{2}(x-3)^2 - 8$	✓✓✓ $a = \frac{1}{2}$ ✓ substitusie ✓ substitusie ✓ antwoord (6)

	OPSIE 4 $a = \frac{1}{2}$ As van simmetrie: $x = 3$ $f(x) = \frac{1}{2}(x-3)^2 + q$ $q = f(3)$ $q = \frac{1}{2}(3+1)(3-7)$ $q = -8$ $y = \frac{1}{2}(x-3)^2 - 8$	✓✓✓ $a = \frac{1}{2}$ ✓ substitusie ✓ substitusie ✓ antwoord (6)
6.4	$h(x) = -f(x) = \frac{-1}{2}(x-3)^2 + 8$	✓ antwoord (1)
6.5	$1 - f(x) = -\frac{1}{2}(x-3)^2 + 9$ $\therefore$ Maksimum waarde is 9. **OF** Maksimum waarde = 1 – (– 8) = 9 OF $t(x) = -\frac{1}{2}x^2 + 3x + \frac{9}{2}$ $t'(x) = -x + 3 = 0$ Maks $V_{\text{by } x=3} = -\frac{1}{2}(3)^2 + 3(3) + \frac{9}{2} = 9$	✓ metode ✓ antwoord (2)
6.6	$f(x^2 - 2) = 0$ $f(x) = 0$ *as* $x = -1$ of $x = 7$ $\therefore f(x^2 - 2) = 0$ as $x^2 - 2 = -1$ of $x^2 - 2 = 7$ $\therefore x^2 = 1$ of $x^2 = 9$ $\therefore x = 1$ of $x = -1$ of $x = 3$ of $x = -3$	✓ substitusie ✓ vereenvoudiging ✓ antwoord ✓ antwoord (4)

	OF $\frac{1}{2}\left(x^2-2-3\right)^2-8=0$ $\frac{1}{2}\left(x^2-5\right)^2=8$ $\left(x^2-5\right)^2=16$ $x^2-5=4 \quad \text{of} \quad x^2-5=-4$ $x^2=9 \quad \text{of} \quad x^2=1$ $x=3 \text{ of } x=-3 \text{ of } x=1 \text{ of } x=-1$ **OF** $f(x^2-2)=0$ $\frac{1}{2}\left(x^2-2-3\right)^2-8=0$ $\frac{1}{2}\left(x^2-5\right)^2=8$ $\left(x^2-5\right)^2-16=0$ $\left(x^2-5-4\right)\left(x^2-5+4\right)=0$ $\left(x^2-9\right)\left(x^2-1\right)=0$ $(x-3)(x+3)(x-1)(x+1)=0$ $x=3 \text{ of } x=-3 \text{ of } x=1 \text{ of } x=-1$	✓ substitusie ✓ vereenvoudiging ✓ faktore ✓ antwoord (4) ✓ substitusie ✓ vereenvoudiging ✓ faktore ✓ antwoord (4) **[15]**

VRAAG 7

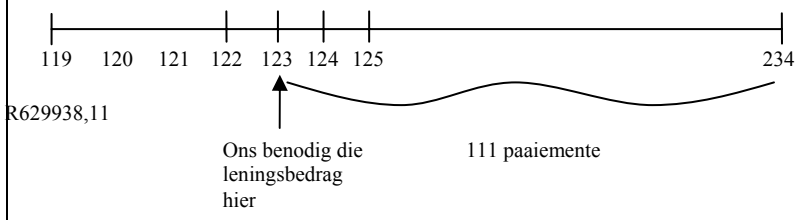
7.1	Dalende funksie Omdat $0 < a < 1$ **OF** Soos x toeneem, neem $f(x)$ af	✓ dalende ✓ $a < 1$ (2)
7.2	$f^{-1}: \quad x=\left(\frac{1}{3}\right)^y$ **OF**  $y=\log_{\frac{1}{3}} x$ OF $f^{-1}: \quad x=\left(\frac{1}{3}\right)^y$ $y=-\log_3 x$	✓ $x=\left(\frac{1}{3}\right)^y$ ✓ $y=\log_{\frac{1}{3}} x$ of $y=-\log_3 x$ (2)
7.3	$y=-5$	✓ antwoord (1)

7.4	Refleksie in $y = x$. Refleksie in die x-as. **OF** Refleksie in die y-as. Dan 'n refleksie in die lyn $y = x$. **OF** Refleksie om die lyn $y = -x$ gevolg deur refleksie om die y-as. **OF** Rotasie deur $90°$ in 'n kloksgewyse rigting. **OF** Rotasie deur $90°$ in 'n anti-kloksgewyse rigting. Refleksie in die oorsprong.	✓ refleksie in $y = x$ ✓ refleksie in die y-as (2) ✓ refleksie in y-as ✓ refleksie in $y = x$ (2) ✓ rotasie deur $90°$ ✓ kloksgewyse rigting (2) ✓ antwoord ✓ antwoord (2) **[7]**

VRAAG 8

8.1	$A = P(1+i)^n$ $1711{,}41 = 1430{,}77\left(1+\frac{i}{12}\right)^{18}$ $\left(1+\frac{i}{12}\right)^{18} = 1{,}196146131...$ **OF** $1+\frac{i}{12} = 1{,}009999937...$ $i = 0{,}1199992431...$ Koers = 12, 00% p.j. maandeliks saamgestel. $\left[\frac{1711{,}41}{1430{,}77}\right]^{\frac{1}{18}}$ $= 1{,}00999...$ $\therefore i = 12(1{,}01-1)$ $= 0{,}12$ $= 12\%$	✓ substitusie ✓$\left(1+\frac{i}{12}\right)^{18} = 1{,}196146131...$ ✓$1+\frac{i}{12} = 1{,}009999937...$ ✓ antwoord (4)

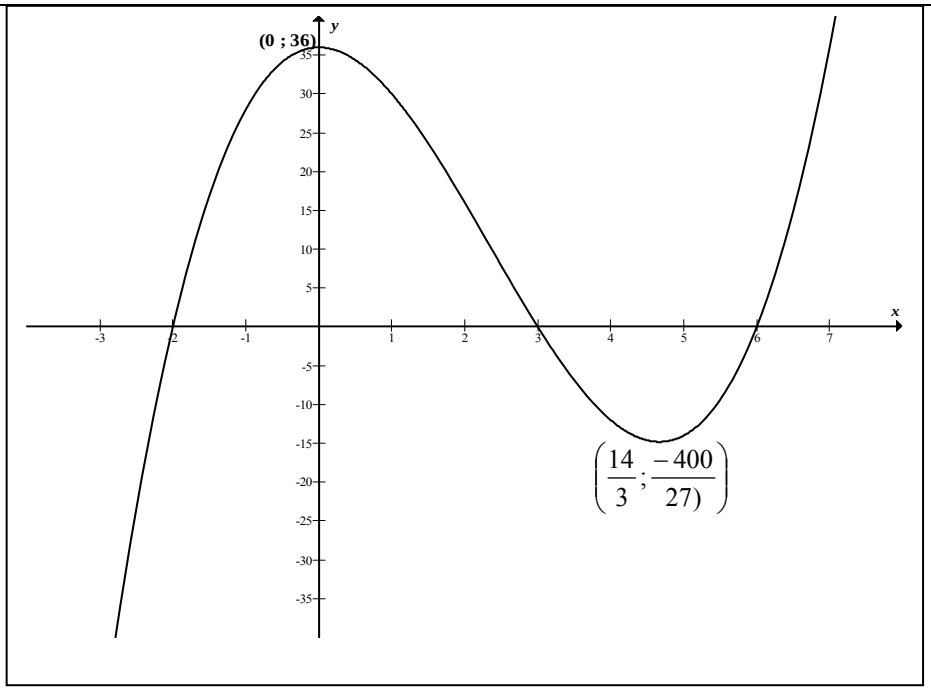
8.2.1	$P_v = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $800000 = \frac{10000\left[1-\left(1+\frac{0,14}{12}\right)^{-n}\right]}{\frac{0,14}{12}}$ $1-\left(1+\frac{0,14}{12}\right)^{-n} = \frac{14}{15} \quad (= 0,933333)$ $\left(1+\frac{0,14}{12}\right)^{-n} = \frac{1}{15} \quad (= 0,06666666)$ $\log\left(1+\frac{0,14}{12}\right)^{-n} = \log\frac{1}{15}$ $-n\log\left(1+\frac{0,14}{12}\right) = \log\frac{1}{15} \quad \left(-n = \frac{\log\frac{1}{15}}{\log\left(1+\frac{0,14}{12}\right)} = -233,47\right)$ $n = 233,47$ $\therefore$ die lening sal opbetaald wees aan die einde van die 234ste maand	✓ vervang in P_v ✓ $i = \frac{0,14}{12}$ ✓ gebruik van logs ✓ antwoord (4)
	OF Uitstaande balans na 233ste maand $= 800000\left(1+\frac{0,14}{12}\right)^{233} - \frac{10000\left[\left(1+\frac{0,14}{12}\right)^{233}-1\right]}{\frac{0,14}{12}}$ = R4 660,04 wat minder is as R10 000 Daarom sal die lening na 234 maande opbetaald wees.	✓ substitusie in P formule ✓ 234 ✓ antwoord ✓ argument (4)
	OF Totale waarde van die lening na 234 paaiemente $= \frac{10000\left(1-\left(1+\frac{0,14}{12}\right)^{-234}\right)}{\frac{0,14}{12}}$ = R800 350,21 > R800 000 en die verskil is minder as R10 000 Daarom sal die lening na 234 maande opbetaald wees.	✓ substitusie in F formule ✓ 234 ✓ antwoord ✓ argument (4)

8.2.2	Uitstaande balans na 119 maande $= 800000\left(1+\frac{0,14}{12}\right)^{119} - \frac{10000\left[\left(1+\frac{0,14}{12}\right)^{119}-1\right]}{\frac{0,14}{12}}$ = R629 938,11  Totaal betaalbaar aan die einde van die 123^{ste} maand $= 629\,938,11\left(1+\frac{0,14}{12}\right)^{4}$ = R 659 853,68 Nuwe paaiement: $659\,853,68 = \frac{x\left[1-\left(1+\frac{0,14}{12}\right)^{-111}\right]}{\frac{0,14}{12}}$ x = R10 632,39	✓ $800000\left(1+\frac{0,14}{12}\right)^{119}$ ✓ $\frac{10000\left[\left(1+\frac{0,14}{12}\right)^{119}-1\right]}{\frac{0,14}{12}}$ ✓ R629 938,11 ✓ $629938,11\left(1+\frac{0,14}{12}\right)^{4}$ ✓ R 659 853,68 ✓ substitusie in P_v ✓ antwoord (7) **[15]**

VRAAG 9

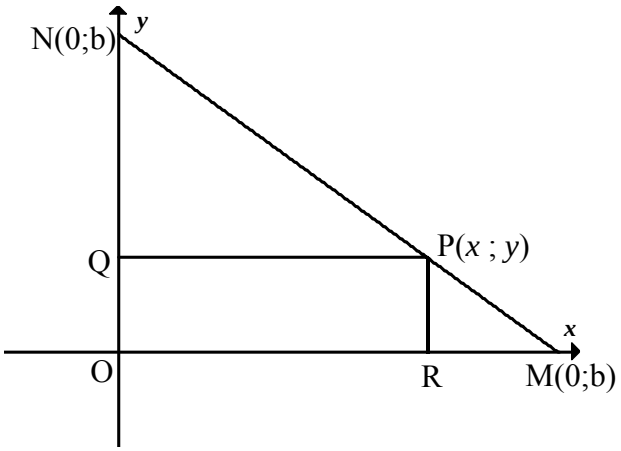
9.1	$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0} \frac{1-3(x+h)^2-(1-3x^2)}{h}$ $= \lim_{h\to 0} \frac{1-3x^2-6xh-3h^2-1+3x^2}{h}$ $= \lim_{h\to 0} \frac{-6xh-3h^2}{h}$ $= \lim_{h\to 0} \frac{h(-6x-3h)}{h}$ $= \lim_{h\to 0} (-6x-3h)$ $= -6x$	✓ substitusie in formule ✓ $1-3x^2-6xh-3h^2$ ✓ $h(-6x-3h)$ ✓ antwoord (4)
9.2	$D_x\left[4-\frac{4}{x^3}-\frac{1}{x^4}\right]$ $= D_x\left[4-4x^{-3}-x^{-4}\right]$ $= 12x^{-4}+4x^{-5}$	✓ vereenvoudiging ✓✓ antwoord (3)
9.3	$y = \left(1+\sqrt{x}\right)^2$ $y = 1+2\sqrt{x}+x$ $y = 1+2x^{\frac{1}{2}}+x$ $\frac{dy}{dx} = x^{-\frac{1}{2}}+1$	✓ uitbreiding ✓ $x^{-\frac{1}{2}}$ ✓ 1 (3) **[10]**

VRAAG 10

10.1	$(-6)(-3)(+2) = 36$ y-afsnit is 36 **OF** $g(x) = (x-6)(x^2 - x - 6)$ $g(x) = x^3 - 7x^2 + 36$ y-afsnit : (0;36)	✓ $(-6)(-3)(+2)$ ✓ y-afsnit is 36 (1) ✓drieterm ✓ 36 (1)
10.2	$g(x) = 0$ $x = 6$ of $x = 3$ of $x = -2$ afsnitte is (6 ; 0) en (3 ; 0) en (– 2; 0)	✓ $g(x) = 0$ ✓ alle x-afsnitte (2)
10.3	$g(x) = (x-6)(x^2 - x - 6)$ $= x^3 - 7x^2 + 36$ $g'(x) = 3x^2 - 14x$ $0 = x(3x - 14)$ $x = 0$ of $x = \frac{14}{3}$ Draaipunte is (0 ; 36) en $\left(\frac{14}{3} ; -\frac{400}{27}\right)$	✓ $x^3 - 7x + 36$ ✓ $g'(x) = 3x^2 - 14x$ ✓ $g'(x) = 0$ ✓ antwoorde ✓✓ punte (6)
10.4		✓ x-afsnitte ✓✓ draaipunte ✓ vorm (4)

10.5	$g(x).g'(x < 0$ $x < -2$ of $0 < x < 3$ of $\frac{14}{3} < x < 6$	1 punt vir elke ongelykheid (3) **[16]**

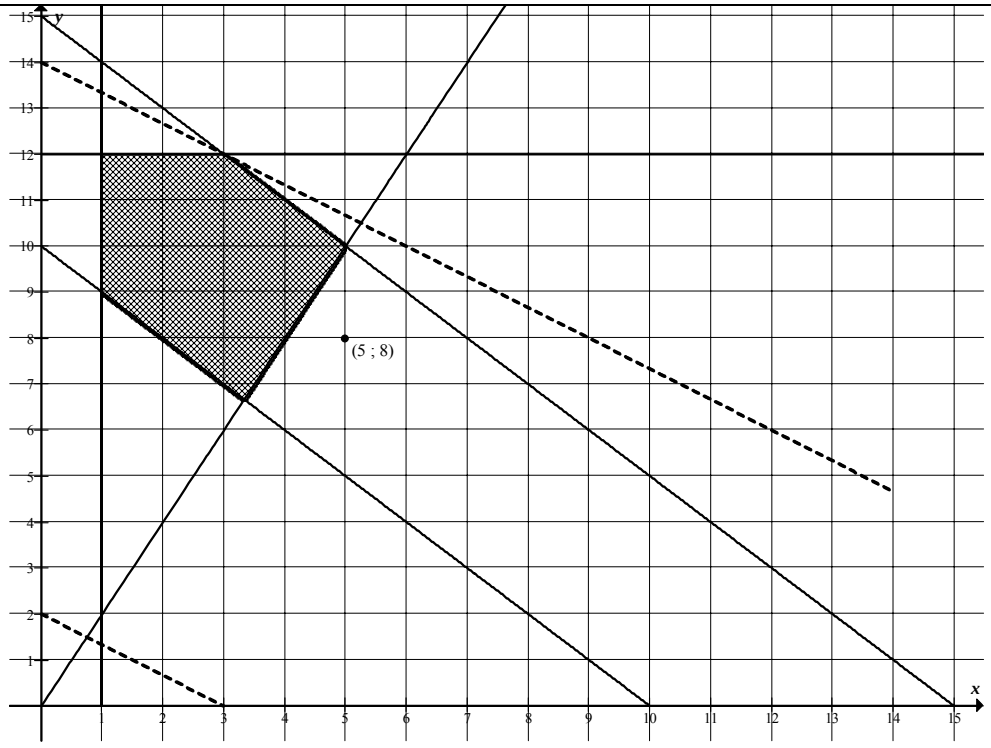
VRAAG 11



11.1	$m = -\frac{b}{a}$ $y - b = \frac{-b}{a}(x - 0)$ $y = \frac{-b}{a}x + b$ OF $y = mx + b$ $0 = ma + b$ $m = \frac{-b}{a}$ $y = -\frac{b}{a}x + b$ OF $\frac{x}{a} + \frac{y}{b} = 1$	✓ $m = -\frac{b}{a}$ ✓ antwoord (2)
11.2	A = xy $A = x\left(\frac{-bx}{a} + b\right)$ $= -\frac{b}{a}x^2 + bx$ $\frac{dA}{dx} = -\frac{2b}{a}x + b$ $0 = -\frac{2b}{a}x + b$ $-ba = -2bx$ $x = \frac{a}{2}$ $y = -\frac{b}{a}\left(\frac{a}{2}\right) + b$ $= \frac{b}{2}$ P$\left(\frac{a}{2}; \frac{b}{2}\right)$ wat die middelpunt van MN is **OF**	✓ area formule ✓ substitusie ✓ $\frac{dA}{dx} = -\frac{2b}{a}x + b$ ✓ $\frac{dA}{dx} = 0$ ✓ x-waarde ✓ y-waarde (6)

	$\frac{x}{a}+\frac{y}{b}=1$ $\frac{y}{b}=1-\frac{x}{a}$ Om xy te maksimeer, maksimeer ons $\frac{xy}{ab}=\frac{x}{a}\left(\frac{y}{b}\right)=\frac{x}{a}\left(1-\frac{x}{a}\right)$ Dit is 'n maksimum wanneer $\frac{x}{a}=\frac{1}{2}$ d.i. $x=\frac{a}{2}$ Volgens die middelpuntstelling is P dan die middelpunt van MN.	(6) **[8]**

VRAAG 12

12.1	$x \geq 1$ $y \leq 12$ $x+y \geq 10$ $x+y \leq 15$ $y \geq 2x$ $x, y \in N_0$	✓ $x \geq 1$ ✓ $y \leq 12$ ✓ $x+y \geq 10$ ✓ $x+y \leq 15$ ✓✓ $y \geq 2x$ (6)
12.2		✓ $x \geq 1$; ✓ $y \leq 12$ ✓ $x+y \leq 15$ ✓ $x+y \geq 10$ ✓ $y \geq 2x$ ✓ toelaatbare gebied (7)
12.3	Nee. Die punt (5 ; 8) lê buite die toelaatbare gebied OF 8 is nie groter as 2(5) =10	✓ Nee ✓ Rede (2)

12.4	$I = 600x + 900y$ $y = -\frac{2}{3}x + \frac{I}{900}$ Maksimum Inkomste by (3 ; 12) 3 enkel slaapkamers en 12 dubbel slaapkamers **OF** Om die profyt/wins te optimaliseer, moet die groep so veel as moontlik kamers bou en dan, so veel as moontlik dubbelkamers. So 15 kamers, 12 dubbelkamers en 3 enkelkamers.	✓ doelfunksie ✓ soeklyn ✓ antwoord (3) **[18]**

TOTAAL: 150