basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIORSERTIFIKAAT-EKSAMEN

WISKUNDE V1

2017

PUNTE: 150

TYD: 3 uur

Hierdie vraestel bestaan uit 9 bladsye en 1 inligtingsblad.

INSTRUKSIES EN INLIGTING

Lees die volgende instruksies aandagtig deur voordat jy die vrae beantwoord.

1. Hierdie vraestel bestaan uit 11 vrae.
2. Beantwoord AL die vrae.
3. Nommer die antwoorde korrek volgens die nommeringstelsel wat in hierdie vraestel gebruik is.
4. Dui ALLE berekeninge, diagramme, grafieke ensovoorts wat jy gebruik het om jou antwoorde te bepaal, duidelik aan.
5. Volpunte sal nie noodwendig aan slegs antwoorde toegeken word nie.
6. Jy mag 'n goedgekeurde wetenskaplike sakrekenaar (nieprogrammeerbaar en niegrafies) gebruik, tensy anders vermeld.
7. Indien nodig, rond antwoorde tot TWEE desimale plekke af, tensy anders vermeld.
8. Diagramme is NIE noodwendig volgens skaal geteken NIE.
9. 'n Inligtingsblad met formules is aan die einde van die vraestel ingesluit.
10. Skryf netjies en leesbaar.

VRAAG 1

1.1 Los op vir x:

1.1.1 $3x^2+10x+6=0$ (korrek tot TWEE desimale plekke) (3)

1.1.2 $\sqrt{6x^2-15}=x+1$ (5)

1.1.3 $x^2+2x-24\geq 0$ (3)

1.2 Los gelyktydig op vir x en y:

$5x+y=3$ en $3x^2-2xy=y^2-105$ (6)

1.3 1.3.1 Los op vir p as $p^2-48p-49=0$ (3)

1.3.2 Vervolgens, of andersins, los op vir x as $7^{2x}-48\left(7^x\right)-49=0$ (3)

[23]

VRAAG 2

2.1 Gegee die meetkundige ry: $3\ ;\ 2\ ;\ k\ ;\ ...$

2.1.1 Skryf die waarde van die gemeenskaplike verhouding neer. (1)

2.1.2 Bereken die waarde van k. (2)

2.1.3 Bereken die waarde van n as $T_n=\frac{128}{729}$. (4)

2.2 In 'n Wiskunde-kompetisie is die totale prysgeld vir die finaliste R30 500. Elke finalis sal aan die einde van die kompetisie 'n gedeelte van die prysgeld volgens sy/haar posisie ontvang. Die tabel hieronder toon die posisie van die finaliste aan die einde van die kompetisie en die prysgeld ontvang.

POSISIE VAN DIE FINALIS AAN DIE EINDE VAN DIE KOMPETISIE	**PRYSGELD**
Laaste	R100
Tweede laaste	R250
Derde laaste	R400
Vierde laaste	R550
. . . .	. . . .
Eerste	Rx

2.2.1 Bereken die prysgeld van die finalis wat 18^{de} laaste gekom het. (2)

2.2.2 Bereken x. (6)

[15]

VRAAG 3

Gegee die kwadratiese ry: 0; 17; 32; ...

3.1 Bepaal 'n uitdrukking vir die algemene term, T_n, van die kwadratiese ry. (4)

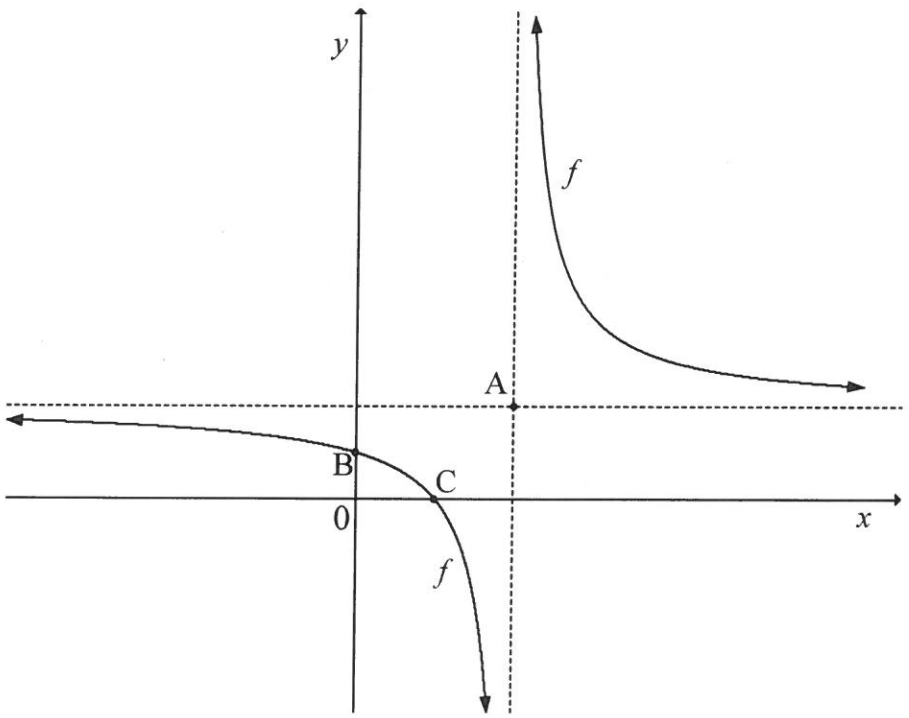
3.2 Watter terme in die kwadratiese ry het 'n waarde van 56? (3)

3.3 Vervolgens, of andersins, bereken die waarde van $\sum_{n=5}^{10} T_n - \sum_{n=11}^{15} T_n$. (4)

[11]

VRAAG 4

Die skets hieronder toon die grafiek van $f(x) = \frac{6}{x-4} + 3$. Die asimptote van f sny mekaar by A. Die grafiek f sny die x-as en y-as by C en B onderskeidelik.



4.1 Skryf die koördinate van A neer. (1)

4.2 Bereken die koördinate van B. (2)

4.3 Bereken die koördinate van C. (2)

4.4 Bereken die gemiddelde gradiënt van f tussen B en C. (2)

4.5 Bepaal die vergelyking van 'n simmetrielyn van f wat 'n positiewe y-afsnit het. (2)

[9]

VRAAG 5

Gegee: $f(x)=x^2-5x-14$ en $g(x)=2x-14$

5.1 Skets die grafieke van f en g op dieselfde assestelsel. Dui duidelik alle afsnitte met die asse en draaipunte aan. (6)

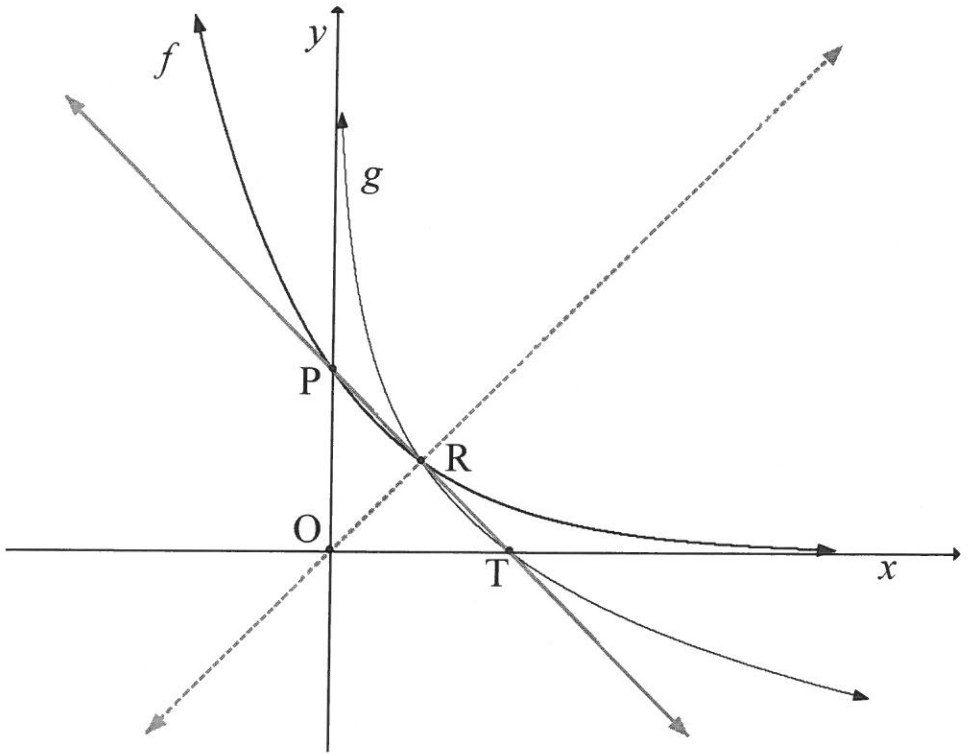
5.2 Bepaal die vergelyking van die raaklyn aan f by $x=2\frac{1}{2}$. (2)

5.3 Bepaal die waarde(s) van k waarvoor $f(x)=k$ twee ongelyke positiewe reële wortels sal hê. (2)

5.4 'n Nuwe grafiek h word verkry deur g eers in die x-axis te reflekteer en dit daarna 7 eenhede na links te verplaas. Skryf die vergelyking van h in die vorm $h(x)=mx+c$ neer. (2)
[12]

VRAAG 6

In die skets hieronder is P die y-afsnit van die grafiek van $f(x)=b^x$. T is die x-afsnit van grafiek g, die inverse van f. R is die snypunt van f en g. Reguitlyne is deur O en R en deur P en T getrek.



6.1 Bepaal die vergelyking van g (in terme van b) in die vorm $y=\ldots$ (2)

6.2 Skryf die vergelyking van die lyn wat deur O en R gaan, neer. (1)

6.3 Skryf die koördinate van punt P neer. (1)

6.4 Bepaal die vergelyking van die lyn wat deur P en T gaan. (2)

6.5 Bereken die waarde van b. (5)
[11]

VRAAG 7

7.1 'n Maatskappy het 'n nuwe masjien vir R500 000 gekoop. Na 3 jaar is die masjien se boekwaarde R331 527. Bereken die jaarlikse depresiasiekoers indien die masjien volgens die verminderdesaldo-metode gedepresieer is. (3)

7.2 Musa neem 'n persoonlike lening by 'n bank uit om 'n motorfiets te koop wat R46 000 kos. Die bank vra rente teen 24% per jaar, maandeliks saamgestel.

Hoeveel maande sal dit Musa neem om die lening terug te betaal, indien die maandelikse paaiement R1 900 is? (4)

7.3 Neil het 'n beleggingsfonds gestig. Presies 3 maande later, en ook elke 3 maande daarná, het hy R3 500 in die rekening gedeponeer. Die fonds betaal rente teen 7,5% p.j., kwartaalliks saamgestel. Hy het vir 6½ jaar lank, vanaf die datum waarop hy oorspronklik die fonds gestig het, kwartaallikse deposito's in die fonds gemaak.

Neil het geen verdere deposito's in die fonds gemaak nie, maar die geld in dieselfde fonds teen dieselfde rentekoers gelos. Bereken hoeveel hy 10 jaar nadat hy die fonds gestig het, in die fonds sal hê. (6)
[13]

VRAAG 8

8.1 Gegee $f(x)=3-2x^2$. Bepaal $f'(x)$, vanuit eerste beginsels. (5)

8.2 Bepaal $\frac{dy}{dx}$ as $y=\frac{12x^2+2x+1}{6x}$. (4)

8.3 Die funksie $f(x)=x^3+bx^2+cx-4$ het 'n buigpunt by (2 ; 4). Bereken die waardes van b en c. (7)
[16]

VRAAG 9

Gegee: $f(x)=x^3-x^2-x+1$

9.1 Skryf die koördinate van die y-afsnit van f neer. (1)

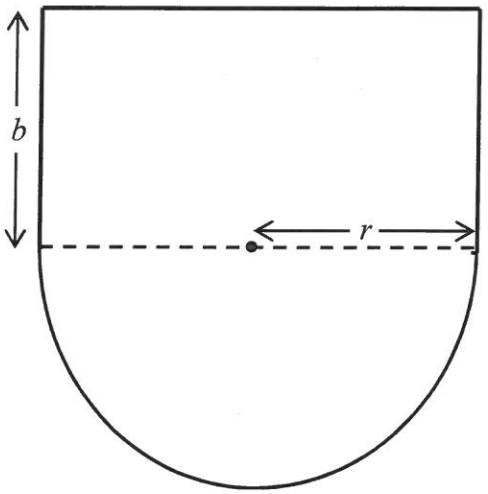
9.2 Bereken die koördinate van die x-afsnitte van f. (5)

9.3 Bereken die koördinate van die draaipunte van f. (6)

9.4 Skets die grafiek van f in jou ANTWOORDEBOEK. Toon duidelik al die afsnitte met die asse en die draaipunte. (3)

9.5 Skryf die waardes van x neer waarvoor $f'(x)<0$. (2)
[17]

VRAAG 10



Die figuur hierbo toon die ontwerp van 'n teaterverhoog in die vorm van 'n halfsirkel met 'n reghoek daaraan vas. Die halfsirkel se radius is r en die reghoek se breedte is b. Die omtrek van die verhoog is 60 m.

10.1 Bepaal 'n uitdrukking vir b in terme van r. (2)

10.2 Vir watter waarde van r sal die oppervlakte van die verhoog 'n maksimum wees? (6)
[8]

VRAAG 11

11.1 Die letters van die woord EQUATION word willekeurig gebruik om 'n nuwe woord, bestaande uit vyf letters, te vorm. Hoeveel sulke woorde is moontlik indien letters nie herhaal mag word nie? (2)

11.2 Daar word gegee dat twee gebeurtenisse, A en B, onafhanklik van mekaar is. $P(A)=\frac{2}{5}$ en $P(B)=0,35$. Bereken P(A of B). (4)

11.3 Graad 12-leerders in 'n sekere dorp kan kies watter een van drie hoërskole hulle wil bywoon. Die tabel hieronder toon die getal graad 12-leerders (as 'n persentasie) elk van die verskillende skole in 2016 bygewoon het en die matriekslaagsyfer van daardie skool (as 'n persentasie) in 2016.

SKOLE	GETAL LEERDERS WAT DIE SKOOL BYGEWOON HET (%)	MATRIEKSLAAGSYFER (%)
A	20	35
B	30	65
C	50	90

Indien 'n leerder van hierdie dorp, wat in 2016 in graad 12 was, ewekansig gekies word, bepaal die waarskynlikheid dat die leerder:

11.3.1 Nie Skool A bygewoon het nie (2)

11.3.2 Skool B bygewoon het en in 2016 graad 12 gedruip het (3)

11.3.3 Graad 12 in 2016 geslaag het (4)

[15]

TOTAAL: 150

INLIGTINGSBLAD

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n \qquad A = P(1+i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a\left(r^n - 1\right)}{r-1} \;; r \neq 1 \qquad S_\infty = \frac{a}{1-r} \;; -1 < r < 1$$

$$F = \frac{x\left[(1+i)^n - 1\right]}{i} \qquad P = \frac{x\left[1 - (1+i)^{-n}\right]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad \mathrm{M}\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

$$\text{oppervlakte } \Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum x}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ of } B) = P(A) + P(B) - P(A \text{ en } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

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SENIOR CERTIFICATE EXAMNATIONS
SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P1/*WISKUNDE V1*

2017

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS: 150
PUNTE: 150

These marking guidelines consist of 20 pages.
Hierdie nasienriglyne bestaan uit 20 bladsye.

NOTE:

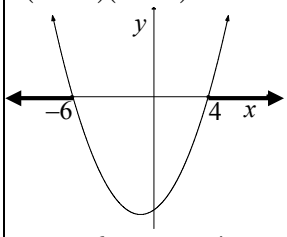
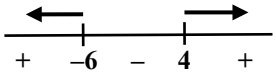
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent Accuracy applies in all aspects of the marking memorandum.

LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.*
- *Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die memorandum van toepassing.*

QUESTION/*VRAAG* 1

1.1.1	$3x^2+10x+6=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-10\pm\sqrt{(10)^2-4(3)(6)}}{2(3)}$ $x=-2{,}55 \quad \text{or} \quad x=-0{,}78$ **OR/OF** $x^2+\frac{10}{3}x+\frac{100}{36}=-2+\frac{100}{36}$ $\left(x+\frac{5}{3}\right)^2=\frac{7}{9}$ $x+\frac{5}{3}=\pm\frac{\sqrt{7}}{3}$ $x=\frac{-5\pm\sqrt{7}}{3}$ $x=-0{,}78 \quad \text{or} \quad x=-2{,}55$	✓ substitution into correct formula ✓ $x=-2{,}55$ ✓ $x=-0{,}78$ (3) ✓for adding $\frac{100}{36}$ on both sides ✓ $x=-2{,}55$ ✓ $x=-0{,}78$ (3)
1.1.2	$\sqrt{6x^2-15}=x+1$ $6x^2-15=(x+1)^2$ $6x^2-15=x^2+2x+1$ $5x^2-2x-16=0$ $(5x+8)(x-2)=0$ $x=-\frac{8}{5} \text{ or } x=2$ $\therefore x=2$	✓ concept of squaring both sides ✓ standard form (accurate) ✓ factors ✓ both answers ✓ correct selection (5)

1.1.3	$x^2 + 2x - 24 \geq 0$ $(x+6)(x-4) \geq 0$  **OR**  $x \leq -6$ or $x \geq 4$	✓ factors ✓✓ $x \leq -6$ or $x \geq 4$ (3)
1.2	$y = -5x + 3$ $3x^2 - 2x(-5x+3) = (-5x+3)^2 - 105$ $3x^2 + 10x^2 - 6x = 25x^2 - 30x + 9 - 105$ $-12x^2 + 24x + 96 = 0$ $x^2 - 2x - 8 = 0$ $(x-4)(x+2) = 0$ $x = -2$ or $x = 4$ $y = 13$ or $y = -17$ **OR/*OF*** $x = \frac{3-y}{5}$ $3\left(\frac{3-y}{5}\right)^2 - 2y\left(\frac{3-y}{5}\right) = y^2 - 105$ $3\left(\frac{9-6y+y^2}{25}\right) - 2y\left(\frac{3-y}{5}\right) = y^2 - 105$ $27 - 18y + 3y^2 - 30y + 10y^2 = 25y^2 - 2625$ $12y^2 + 48y - 2652 = 0$ $y^2 + 4y - 221 = 0$ $(y-13)(y+17) = 0$ $y = -17$ or $y = 13$ $x = \frac{3+17}{5}$ or $x = \frac{3-13}{5}$ $x = 4$ or $x = -2$	✓ y subject of formula ✓ substitution ✓ simplification ✓ factors ✓ values of x ✓ values of y (6) ✓ x subject of formula ✓ substitution ✓ simplification ✓ factors ✓ values of y ✓ values of x (6)
1.3.1	$p^2 - 48p - 49 = 0$ $(p-49)(p+1) = 0$ $p = -1$ or $p = 49$	✓ factors ✓ $p = -1$ ✓ $p = 49$ (3)
1.3.2	$7^x = -1$ or $7^x = 49$ no solution $x = 2$	✓ $7^x = -1$ or $7^x = 49$ ✓ no solution ✓ $x = 2$ (3) **[23]**

QUESTION/*VRAAG* 2

2.1.1	3; 2; k; ... $r = \frac{2}{3}$	✓ $r = \frac{2}{3}$ / 0,67 (1)
2.1.2	$r = \frac{T_3}{T_2}$ $T_3 = r \times T_2$ $= \frac{2}{3} \times 2$ $= \frac{4}{3}$ Thus $k = \frac{4}{3}$	✓ $\frac{2}{3} \times 2$ ✓ $\frac{4}{3}$ / 1,34 (2)
2.1.3	$T_n = a.r^{n-1}$ $\frac{128}{729} = 3 \times \left(\frac{2}{3}\right)^{n-1}$ $\left(\frac{2}{3}\right)^{n-1} = \frac{128}{2187}$ $\left(\frac{2}{3}\right)^{n-1} = \left(\frac{2}{3}\right)^{7}$ $n-1 = 7$ $n = 8$ **OR / OF** $T_n = a.r^{n-1}$ $\frac{128}{729} = 3 \times \left(\frac{2}{3}\right)^{n-1}$ $\left(\frac{2}{3}\right)^{n-1} = \frac{128}{2187}$ $n-1 = \log_{\frac{2}{3}} \frac{128}{2189}$ $n-1 = 7$ $n = 8$	✓ $\frac{128}{729} = 3 \times \left(\frac{2}{3}\right)^{n-1}$ ✓ $\left(\frac{2}{3}\right)^{n-1} = \frac{128}{2187}$ ✓ $\left(\frac{2}{3}\right)^{7}$ ✓answer **OR / OF** ✓ $\frac{128}{729} = 3 \times \left(\frac{2}{3}\right)^{n-1}$ ✓ $\left(\frac{2}{3}\right)^{n-1} = \frac{128}{2187}$ ✓ $n-1 = \log_{\frac{2}{3}} \frac{128}{2189}$ ✓answer (4)
2.2.1	$T_n = a + (n-1)d$ $T_{18} = 100 + (18-1)(150)$ $=$ R 2 650	✓ substitution of n, a and d into AS ✓ 2 650 (2)

2.2.2	$S_n = \frac{n}{2}[2a + (n-1)d]$ $30\,500 = \frac{n}{2}[2(100) + (n-1)(150)]$ $61\,000 = n(150n + 50)$ $61\,000 = 150n^2 + 50n$ $3n^2 + n - 1\,220 = 0$ $(3n + 61)(n - 20) = 0$ $n = -\frac{61}{3}$ or $n = 20$ N/A $x = 100 + (20-1)(150)$ $= \text{R } 2\,950$	✓substitute 30 500, a and d into sum formula for AS ✓ simplification ✓ factors or quad formula ✓ $n = 20$ ✓ substitution T_n of AS ✓ 2 950 (6) **[15]**

QUESTION/*VRAAG* 3

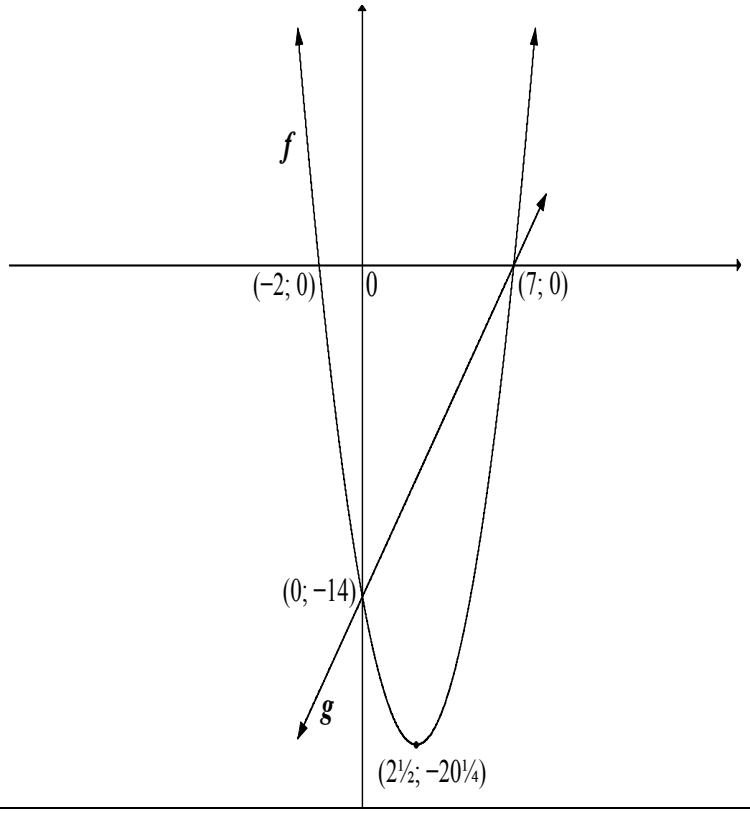
3.1	First differences: 17; 15 Second difference: –2 $T_n = an^2 + bn + c$ $a = \frac{\text{second difference}}{2} = \frac{-2}{2} = -1$ $3a + b = 17$ $3(-1) + b = 17$ $b = 20$ $a + b + c = 0$ $-1 + 20 + c = 0$ $c = -19$ $T_n = -n^2 + 20n - 19$ **OR / OF** First differences: 17; 15 $T_n = T_1 + (n-1)d_1 + \frac{(n-1)(n-2)}{2}d_2$ $= (0) + (n-1)(17) + \frac{(n-1)(n-2)}{2}(-2)$ $= 17n - 17 - n^2 + 3n - 2$ $= -n^2 + 20n - 19$	✓17; 15 ✓value of a ✓ value of b ✓value of c ✓17; 15 ✓value of a ✓ value of b ✓value of c (4)

3.2	$56 = -n^2 + 20n - 19$ $n^2 - 20n + 75 = 0$ $(n-15)(n-5) = 0$ $n = 5$ or $n = 15$	✓ $T_n = 56$ ✓factors ✓both answers (3)
3.3	$\sum_{n=5}^{10} T_n - \sum_{n=11}^{15} T_n$ $= T_5 + T_6 + T_7 + T_8 + T_9 + T_{10} - T_{11} - T_{12} - T_{13} - T_{14} - T_{15}$ $= (T_5 - T_{15}) + (T_6 - T_{14}) + ... + (T_9 - T_{13}) + T_{10}$ $= T_{10}$ because by symmetry $T_5 = T_{15}$; $T_6 = T_{14}$ ..... $T_{10} = -(10)^2 + 20(10) - 19$ $= 81$ **OR/*OF*** T_5 T_{10} T_{15} 0; 17; 32; 45; 56; 65; 72; 77; 80; 81; 80; 77; 72; 65; 56 Hence, $\sum_{n=5}^{10} T_n - \sum_{n=11}^{15} T_n$ $= (56 + 65 + 72 + 77 + 80 + 81) - (80 + 77 + 72 + 65 + 56)$ $= 81$	✓✓ symmetry of terms ✓ T_{10} ✓ 81 (4) ✓ writing out the symmetry of terms ✓ $56 + 65 + 72 + 77 + 80 + 81$ ✓ $80 + 77 + 72 + 65 + 56$ ✓ 81 (4) **[11]**

QUESTION/*VRAAG* 4

4.1	A (4; 3)	✓(4; 3) (1)
4.2	$y = \frac{6}{-4} + 3$ $= \frac{3}{2}$ $B\left(0 ; \frac{3}{2}\right)$	✓ $x = 0$ ✓ $y = \frac{3}{2}$ (2)
4.3	$0 = \frac{6}{x-4} + 3$ $-3 = \frac{6}{x-4}$ $-3(x-4) = 6$ $-3x + 12 = 6$ $x = 2$ C(2 ; 0)	✓$y = 0$ ✓ $x = 2$ (2)
4.4	Average gradient $= \frac{0-\frac{3}{2}}{2-0}$ $= -\frac{3}{4}$	✓ $\frac{0-\frac{3}{2}}{2-0}$ ✓ $-\frac{3}{4}$ (2)
4.5	$y = -x + 7$ **OR/*OF*** $m = -1$ $\therefore y - 3 = -(x-4)$ $y = -x + 7$	✓ $m = -1$ ✓ $y = -x + 7$ **OR/*OF*** ✓ $m = -1$ ✓ $y = -x + 7$ (2) **[9]**

QUESTION/*VRAAG* 5

5.1		*f*: ✓ *x*-intercepts ✓*y*-intercept ✓ shape ✓TP *g*: ✓ *x*-intercept and *y*-intercept ✓ shape (6)
5.2	$y = -20\frac{1}{4}$	✓✓ $y = -20\frac{1}{4}$ / $-\frac{81}{4}$ (2)
5.3	$-20\frac{1}{4} < k < -14$	✓ $-20\frac{1}{4} < k$ ✓ $k < -14$ (2)
5.4	Reflecting in the *x*-axis: $y = -2x + 14$ Shifting 7 units to the left: $y = -2(x + 7) + 14$ $= -2x - 14 + 14$ $= -2x$	✓ $y = -2x + 14$ ✓ $y = -2x$ (2) **[12]**

QUESTION/*VRAAG* 6

6.1	$f: y = b^x$ $f^{-1}: x = b^y$ $y = \log_b x$	✓ interchange x and y ✓ answer (2)
6.2	$y = x$	✓ answer (1)
6.3	P(0; 1)	✓ answer (1)
6.4	T(1; 0) $y = mx + c$ $y = -x + 1$	✓ coordinates of T ✓ $y = -x + 1$ (2)
6.5	At point R, PT and OR intersect: $-x + 1 = x$ $2x = 1$ $x = \frac{1}{2}$ $y = \frac{1}{2}$ Substitute $\left(\frac{1}{2}; \frac{1}{2}\right)$ into the equation of f: $y = b^x$ $\frac{1}{2} = b^{\frac{1}{2}}$ $b = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$ **OR/*OF*** At point R, PT and OR intersect: $-x + 1 = x$ $2x = 1$ $x = \frac{1}{2}$ $y = \frac{1}{2}$ Substitute $\left(\frac{1}{2}; \frac{1}{2}\right)$ into the equation of g: $y = \log_b x$ $\frac{1}{2} = \log_b\left(\frac{1}{2}\right)$ $b^{\frac{1}{2}} = \frac{1}{2}$ $b = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$	✓ $-x + 1 = x$ ✓ $x = \frac{1}{2}$ ✓ $y = \frac{1}{2}$ ✓ substitution ✓ $b = \frac{1}{4}$ (5) ✓ $-x + 1 = x$ ✓ $x = \frac{1}{2}$ ✓ $y = \frac{1}{2}$ ✓ substitution ✓ $b = \frac{1}{4}$ (5) **[11]**

QUESTION/*VRAAG* 7

7.1	$A = P(1-i)^n$ $331527 = 500000(1-i)^3$ $(1-i)^3 = \frac{331527}{500000}$ $1-i = \sqrt[3]{\frac{331527}{500000}}$ $i = 0{,}12800...$ $= 12{,}8\%$	✓ substitution of A, P & n in correct formula ✓ $1-i = \sqrt[3]{\frac{331527}{500000}}$ or $1-i = \sqrt[3]{0{,}663054}$ ✓ answer (3)
7.2	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $46\,000 = \frac{1900\left[1-\left(1+\frac{0{,}24}{12}\right)^{-n}\right]}{\frac{0{,}24}{12}}$ $\frac{46}{95} = 1-\left(1+\frac{0{,}24}{12}\right)^{-n}$ $\left(1+\frac{0{,}24}{12}\right)^{-n} = \frac{49}{95}$ $n = -\log_{\left(1+\frac{0{,}24}{12}\right)}\frac{49}{95}$ OR/OF $-n\log\left(1+\frac{0{,}24}{12}\right) = \log\frac{49}{95}$ $= 33{,}43276544...$ months It will take him 34 months to pay back the loan.	✓ $i = \frac{0{,}24}{12} / 0{,}02 / \frac{1}{50}$ ✓ substitution of P , x and i in correct formula ✓ 33,43 ✓ answer (4)
7.3	$F = \frac{x[(1+i)^n - 1]}{i}$ $= \frac{3500\left[\left(1+\frac{0{,}075}{4}\right)^{4\times 6{,}5} - 1\right]}{\frac{0{,}075}{4}}$ $= \text{R } 115\,902{,}69$ $A = P(1+i)^n$ $= 115\,902{,}69\left(1+\frac{0{,}075}{4}\right)^{4\times 3{,}5}$ $= \text{R } 150\,328{,}12$	✓ $i = \frac{0{,}075}{4} / 0{,}01875$ ✓ $n = 4 \times 6{,}5 = 26$ ✓ substitution into correct formula ✓ 115 902,69 ✓ substitution into correct formula ✓ 150 328,12 (6) **[13]**

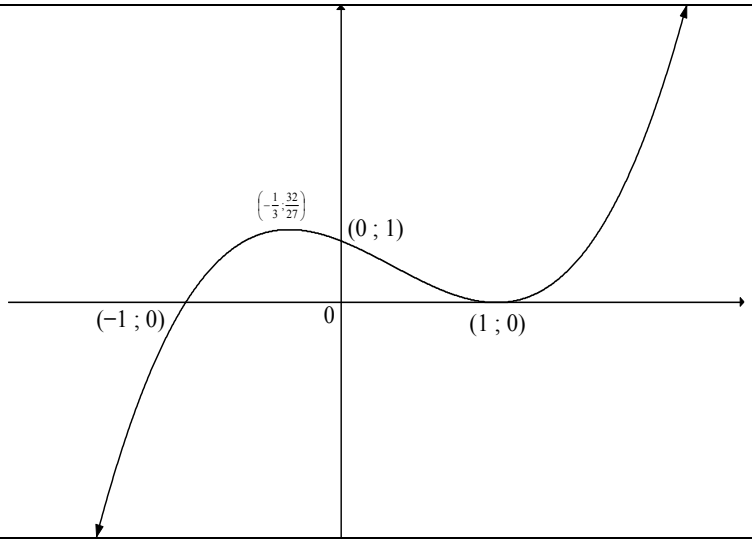
QUESTION/*VRAAG* 8

8.1	$f(x+h)=3-2(x+h)^2$ $=3-2x^2-4xh-2h^2$ $f(x+h)-f(x)=3-2x^2-4xh-2h^2-3+2x^2$ $=-4xh-2h^2$ $f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{-4xh-2h^2}{h}$ $=\lim\limits_{h\to 0}\dfrac{h(-4x-2h)}{h}$ $=\lim\limits_{h\to 0}(-4x-2h)$ $=-4x$ **OR/*OF*** $f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{3-2(x+h)^2-(3-2x^2)}{h}$ $=\lim\limits_{h\to 0}\dfrac{3-2x^2-4xh-2h^2-3+2x^2}{h}$ $=\lim\limits_{h\to 0}\dfrac{-4xh-2h^2}{h}$ $=\lim\limits_{h\to 0}\dfrac{h(-4x-2h)}{h}$ $=\lim\limits_{h\to 0}(-4x-2h)$ $=-4x$	✓ $3-2x^2-4xh-2h^2$ ✓ $-4xh-2h^2$ ✓ $f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ ✓ $\lim\limits_{h\to 0}(-4x-2h)$ ✓ $-4x$ (5) ✓ $f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ ✓ $3-2x^2-4xh-2h^2$ ✓ $-4xh-2h^2$ ✓ $\lim\limits_{h\to 0}(-4x-2h)$ ✓ $-4x$ (5)
8.2	$y=\dfrac{12x^2+2x+1}{6x}$ $=2x+\dfrac{1}{3}+\dfrac{1}{6x}$ $=2x+\dfrac{1}{3}+\dfrac{1}{6}x^{-1}$ $\dfrac{dy}{dx}=2-\dfrac{1}{6}x^{-2}$ $=2-\dfrac{1}{6x^2}$	✓ $\dfrac{12x^2}{6x}+\dfrac{2x}{6x}+\dfrac{1}{6x}$ ✓ $\dfrac{1}{6}x^{-1}$ ✓ 2 ✓ $-\dfrac{1}{6}x^{-2}$ (4)

8.3	$y = x^3 + bx^2 + cx - 4$ $y' = 3x^2 + 2bx + c$ $y'' = 6x + 2b$ At point of inflection: $y'' = 6x + 2b = 0$ Substitute $x = 2$: $6(2) + 2b = 0$ $2b = -12$ $b = -6$ $y = x^3 - 6x^2 + cx - 4$ Substitute $(2; 4)$: $4 = 2^3 - 6(2)^2 + c(2) - 4$ $2c = 24$ $c = 12$ $y = x^3 - 6x^2 + 12x - 4$	✓ $y' = 3x^2 + 2bx + c$ ✓ $y'' = 6x + 2b$ ✓ $y'' = 0$ ✓ sub $x = 2$ into $y'' = 0$ ✓ value of b ✓ substitute $(2;4)$ ✓ value of c (7) **[16]**

QUESTION/*VRAAG* 9

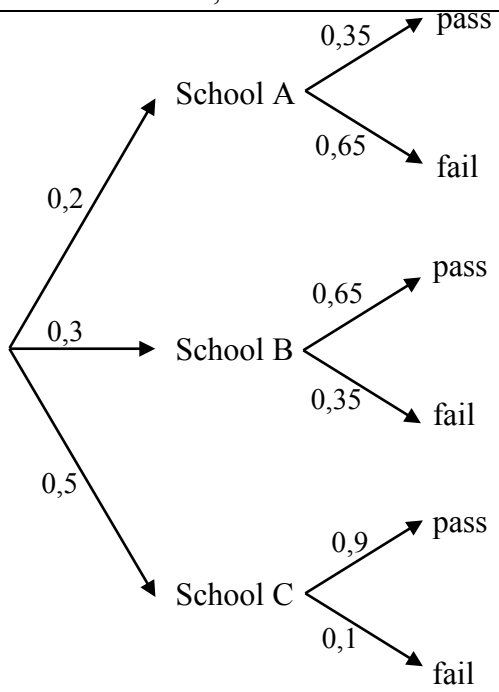
9.1	(0 ; 1)	✓ answer (1)
9.2	$f(x) = x^3 - x^2 - x + 1$ $f(x) = x^2(x-1) - (x-1)$ $f(x) = (x-1)(x^2-1)$ $f(x) = (x-1)(x-1)(x+1)$ $f(x) = 0$ $(x-1)(x-1)(x+1) = 0$ x-intercepts: (–1; 0); (1; 0) **OR** $f(x) = x^3 - x^2 - x + 1$ $f(x) = (x-1)(x^2-1)$ $f(x) = (x-1)(x-1)(x+1)$ $f(x) = 0$ $(x-1)(x-1)(x+1) = 0$ x-intercepts: (–1; 0); (1; 0) **OR**	✓ $(x-1)$ ✓ (x^2-1) ✓ $(x-1)(x-1)(x+1)$ ✓(–1; 0) ✓(1; 0) (5) ✓ $(x-1)$ ✓ (x^2-1) ✓ $(x-1)(x-1)(x+1)$ ✓(–1; 0) ✓(1; 0) (5)

	$f(x)=x^3-x^2-x+1$ $f(x)=(x+1)(x^2-2x+1)$ $f(x)=(x+1)(x-1)(x-1)$ $f(x)=0$ $(x-1)(x-1)(x+1)=0$ x-intercepts: $(-1;0)$; $(1;0)$	✓ $(x+1)$ ✓ (x^2-2x+1) ✓ $(x-1)(x-1)(x+1)$ ✓$(-1;0)$ ✓$(1;0)$ (5)
9.3	$f(x)=x^3-x^2-x+1$ $f'(x)=3x^2-2x-1$ $f'(x)=0$ $(3x+1)(x-1)=0$ $x=-\frac{1}{3}$ or $x=1$ $y=\frac{32}{27}$ $y=0$ $\left(-\frac{1}{3};\frac{32}{27}\right)$ $(1;0)$	✓ $f'(x)=3x^2-2x-1$ ✓ $f'(x)=0$ ✓factorisation ✓x value ✓x value ✓$y=\frac{32}{27}$ (6)
9.4		✓y– and x–intercepts ✓shape ✓turning points (3)
9.5	$f'(x)<0$ $-\frac{1}{3}<x<1$ **OR/*OF*** $(-\frac{1}{3}$; 1)	✓ $x>-\frac{1}{3}$ ✓ $x<1$ (2) ✓ $(-\frac{1}{3}$ ✓ 1) (2) **[17]**

QUESTION/*VRAAG* 10

10.1	$60 = 2b + 2r + \frac{1}{2}(2\pi r)$ $2b = 60 - 2r - \pi r$ $b = 30 - r - \frac{1}{2}\pi r$	✓ $60 = 2b + 2r + \frac{1}{2}(2\pi r)$ ✓ $b = 30 - r - \frac{1}{2}\pi r$ (2)
10.2	Area = area of rectangle + area of semicircle $A(r) = \text{length} \times \text{breadth} + \frac{1}{2}(\text{area of circle})$ $= (2r)\left(30 - r - \frac{1}{2}\pi r\right) + \frac{1}{2}(\pi r^2)$ $= 60r - 2r^2 - \pi r^2 + \frac{1}{2}\pi r^2$ $= 60r - 2r^2 - \frac{1}{2}\pi r^2$ $= 60r - \left(2 + \frac{1}{2}\pi\right)r^2$ For a maximum, $A'(r) = 0$ $60 - 2\left(2 + \frac{1}{2}\pi\right)r = 0$ $60 - (4 + \pi)r = 0$ $r = \frac{60}{4 + \pi}$ $= 8{,}40$ m	✓ $(2r)\left(30 - r - \frac{1}{2}\pi r\right)$ ✓ $\frac{1}{2}(\pi r^2)$ ✓ $60r - 2r^2 - \frac{1}{2}\pi r^2$ ✓ $A'(r) = 0$ ✓ $60 - 2\left(2 + \frac{1}{2}\pi\right)r$ ✓answer (6) **[8]**

QUESTION/*VRAAG* 11

11.1	$8\times7\times6\times5\times4$ or $\frac{8!}{3!}$ $=6720$	✓$8\times7\times6\times5\times4$ / $\frac{8!}{3!}$ ✓6720 (2)
11.2	$P(A \text{ and } B)=P(A)\times P(B)$ $=0,4\times0,35$ $=0,14$ $P(A \text{ or } B)=P(A)+P(B)-P(A \text{ and } B)$ $=0,4+0,35-0,14$ $=0,61$	✓ $0,4\times0,35$ ✓ 0,14 ✓ substitution ✓ answer (4)
		
11.3.1	$100\%-20\%$ or/of $1-0,2$ $=80\%$ $=0,8$ **OR/*OF*** 30% + 50% = 80% or/of 0,3 + 0,5 = 0,8	✓$100\%-20\%$ or $1-0,2$ ✓80% or 0,8 ✓30% + 50% or 0,3 + 0,5 ✓ 80% or 0,8 (2)
11.3.2	$0,3\times0,35=0,105$ $=10,5\%$	✓ 0,3 ✓ 0,35 ✓ $0,105=10,5\%$ (3)
11.3.3	$(0,2\times0,35)+(0,3\times0,65)+(0,5\times0,9)$ $=0,715$ $=71,5\%$	✓$0,2\times0,35$ ✓$0,3\times0,65$ ✓$0,5\times0,9$ ✓answer (4) **[15]**

TOTAL/*TOTAAL*: 150

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P1/*WISKUNDE V1*

2016

MARKING GUIDELINE (ADDENDUM)

MARKS/*PUNTE*: 150

NOTE:
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy applies in ALL aspects of the marking memorandum.

LET WEL:
- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.*

Once a candidate has reached 2 errors related to marks: stop marking.

QUESTION/*VRAAG 1*

1.1.1	• incorrect rounding 2/3 – only rounding penalization • use of calculator 2/3 – this is where use of calculator for factors get used • answer in surd form 2/3 (at least simplified under square root)
1.1.2	• CA mark only if quadratic equation • check answers • if $6x^2 - 15 = x + 1$ breakdown 0/3 • both answer must be seen before selection if no factors are shown • if in the context of their incorrect sum, both of the answers are NA, both need to be shown as NA
1.1.3	$(x+6)(x-4) \geq 0$ • $x \geq 4$ or / and $x \geq -6$, award 1/3 marks (factors) • $x \leq 4$ or / and $x \leq -6$, award 1/3 marks (factors) • $-6 \leq x \leq 4$, award 1/3 marks (factors) • $x \leq -6$ and $x \geq 4$, award 2/3 marks • equal is left out: -1 Answer only 3/3
1.2	**NB**: At the second error related to a mark (two skills) – no further marking. If incorrect algebra leads to the equation being linear: max 2/6 These marks will be the changing of the formula and the substitution mark.
1.3.2	CA from 1.3.1 • If $7^x = p$ can award 1 mark for the concept • If answer $x = 2$ only 2/3

QUESTION/*VRAAG 2*

2.1.2	CA from 2.1.1 Answer only 2/2
2.1.3	Answer only 1/4 • If $n = 7$ 2/4 • Incorrect working that leads to use of logs and an not a natural number max 2/4
2.2.1	Answer only 2/2
2.2.2	• Answer only 1/6

	• S_n has to equal 30 500 otherwise a BD

QUESTION/*VRAAG 3*

3.2	$n = 5$ only 1/3
3.3	Answer only 1/4

QUESTION/*VRAAG 4*

4.1	$x = 4$; $y = 3$ 1/1
4.3	$y = 0$ can be implied
4.4	CA from 4.2 and 4.3

QUESTION/*VRAAG 5*

5.1	Only working out, but no sketch max 4/6 – loose shape mark per graph not sketched
5.2	CA from turning point in 5.1
5.3	CA from sketch (TP to *y*-intercept)
5.4	Answer only 2/2

QUESTION/*VRAAG 6*

6.1	Answer only 2/2 If answer not in terms of b max 1/2
6.3	Coordinate from not needed

QUESTION/*VRAAG 7*
Penalise candidates a maximum of one mark (overall) for notation error in 7.1 and 7.2

7.1	• Interchange A and P – breakdown 0/3 • Wrong formula 0/3 • Early rounding: answer is 12,93% – 2/3
7.3	• i and n incorrect – learner can still get the substitution mark 1/6 • If quarterly is taken as monthly consistently in both parts 5/6 $A = P(1+i)^n$ • If 10 years is used: $= 115\ 902{,}69\left(1+\frac{0{,}075}{4}\right)^{4\times 10}$ 5/6 $= R\ 243\ 667{,}94$

QUESTION/*VRAAG 8*

Penalise candidates a maximum of one mark (overall) for notation error in 8.1 and 8.2

8.1	$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ Notation formula Formula can be implied
8.2	• If function and derivative is mixed but splitting of fractions is evident max ¾ • If they start with differentiation – breakdown 0/4
8.3	$y''=0$ can be implied

QUESTION/*VRAAG 9*

9.2	No working is shown(calculator used) • If the cubic becomes a quadratic 2/5 • If three brackets 5/5
9.3	$f'(x)=0$ cannot be implied $f'(x)=3x^2-2x-1$ $x=-\left(\frac{-2}{2(3)}\right)$ **BE CAREFUL** 1/6 for derivative $=\frac{1}{3}$
9.4	If dots only indicated on the graph 1/3 – x and y-intercepts
9.5	Only CA from a cubic graph Each answer gets evaluated independently

QUESTION/*VRAAG 10*

10.2	Derivative equal to zero is an independent mark $A'(r)=0$ can be implied if working is correct

QUESTION/*VRAAG 11*

If percentages are used – penalize once per question

11.1	Answer only 2/2 2 or 0 marks
11.3.2	Do not penalize rounding
11.3.3	Do not penalize rounding