education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT
PROVINSIALE ASSESSERING

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GRADE 12/*GRAAD 12*

MATHEMATICS P1/*WISKUNDE V1*

JUNE/*JUNIE* 2024

MARKING GUIDELINES/*NASIENRIGLYNE*

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MARKS: 150

TIME: 3 hours

These marking guidelines consists of 14 pages.
Hierdie nasienriglyne bestaan uit 14 bladsye.

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NOTE:

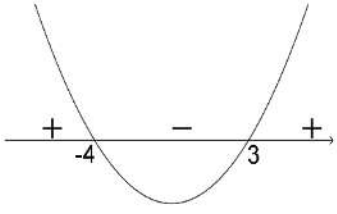
- If a candidate answered a question TWICE, only mark the FIRST attempt.
- Consistent accuracy applies in ALL aspects of the marking guidelines.

LET WEL:

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

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QUESTION/VRAAG 1

1.1 1.1.1	$2x(4-x)=0$ $\therefore x=0 \quad or \mid of \quad x=4$	✓ $x=0$ ✓ $x=4$ (2)
1.1.2	$x(3x-7)=4$ $3x^2-7x-4=0$ $\therefore x=\frac{-(-7)\pm\sqrt{(-7)^2-4(3)(-4)}}{2(3)}$ $\therefore x=2{,}81 \quad or \mid of \quad -0{,}47$	✓ std form ✓ subst ✓✓ each answ/*elke antw* (4)
1.1.3	$x+\sqrt{x-3}=15$ $\sqrt{x-3}=15-x$ $\therefore x-3=(15-x)^2$ $x-3=225-30x+x^2$ $\therefore x^2-31x+228=0$ $\therefore (x-12)(x-19)=0$ $\therefore x=12 \ or \mid of \ x\neq 19$	✓ isol $\sqrt{\square}$ ✓ square /*kwadreer* ✓ std form ✓ factors/*faktore* ✓ $x=12;\ x\neq 19$ (5)
1.1.4	$x^2+x-12>0$ $\therefore (x+4)(x-3)>0$ $\therefore x<-4 \ or \mid of \ x>3$ 	✓ factors/*faktore* ✓ critical values/*kritieke w* ✓✓ answer combo/*antwoord* (4)

1.2	$3x - y = 1$ ..... ① $x^2 + 2xy = 3y^2 - 7$ .....② from / *uit* ① : $y = 3x - 1$ subst in ②: $x^2 + 2x(3x - 1) = 3(3x - 1)^2 - 7$ $\therefore x^2 + 6x^2 - 2x - 27x^2 + 18x - 3 + 7 = 0$ $\therefore -20x^2 + 16x + 4 = 0$ $\therefore 5x^2 - 4x - 1 = 0$ $\therefore (5x + 1)(x - 1) = 0$ $\therefore x = -\frac{1}{5}$ *or* / *of* $x = 1$ if / *as* $x = -\frac{1}{5}: y = 3\left(-\frac{1}{5}\right) - 1 = -\frac{8}{5}$ if / *as* $x = 1 : y = 3(1) - 1 = 2$ **OR/*OF*** $3x - y = 1$ . . . . . ① $x^2 + 2xy = 3y^2 - 7$ . . . . . ② $x = \frac{y+1}{3}$ . . . . . ③ Subst. ③ into/*in* ②: $\left(\frac{y+1}{3}\right)^2 + 2y\left(\frac{y+1}{3}\right) = 3y^2 - 7$ $\frac{y^2 + 2y + 1}{9} + \frac{2y^2 + 2y}{3} = 3y^2 - 7$ $y^2 + 2y + 1 + 6y^2 + 6y = 27y^2 - 63$ $20y^2 - 8y - 64 = 0$ $5y^2 - 2y - 16 = 0$ $(y - 2)(5y + 8) = 0$ $y = 2$ *or* / *of* $y = -\frac{8}{5}$ $x = 1$ *or* / *of* $x = -\frac{1}{5}$	✓ *y* subject/*onderwerp* ✓ subst ✓ std form ✓ faktore/*factors* ✓ both x-values/*beide y-w* ✓ both *y*-values/*beide x-w* (6) ✓ *x* subject/*onderwerp* ✓ subst ✓ std form ✓ faktore/*factors* ✓ both y-values/*beide y-w* ✓ both *x*-values/*beide x-w* (6)

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1.3	$\sqrt[a]{2} = 3;\ \sqrt[b]{3} = 5;\ \sqrt[c]{5} = 8$ $\therefore 2^{\frac{1}{a}} = 3;\ 3^{\frac{1}{b}} = 5;\ 5^{\frac{1}{c}} = 8$ $\therefore \left[\left(2^{\frac{1}{a}}\right)^{\frac{1}{b}}\right]^{\frac{1}{c}} = 8$ $2^{\frac{1}{abc}} = 2^3$ $\frac{1}{abc} = 3$ $\therefore\ abc = \frac{1}{3}$	✓exp form ✓subt ✓exp eq/*eksp verg* ✓answer/*antwoord* (4)
		[25]

QUESTION/VRAAG 2

2.1	$19;\ 8;\ -1;\ -8;\ \ldots$ $-11\ \ -\frac{9}{2}\ \ -7\ \ -\frac{5}{2}$	
2.1.1	$T_5 = -13$	✓-13 (1)
2.1.2	$2a = 2;\ a = 1$ $3a + b = -11$ $3(1) + b = -11;\ b = -14$ $a + b + c = 19$ $1 - 14 + c = 19;\ c = 32$ $\therefore T_n = n^2 - 14n + 32$	✓$a = 1$ ✓$b = -14$ ✓ $c = 32$ ✓answer/*antw* (4)

2.1.3	$T_{26} = (26)^2 - 14(26) + 32$ $= 344$ $T_{25} = (25)^2 - 14(25) + 32$ $= 307$ $\therefore T_{26} - T_{25}$ $= 344 - 307$ $= 37$ **OR/*OF*** $T_n = 2n - 13$ $T_{25} = 2(25) - 13$ $= 37$	✓subst ✓subst ✓answer/*antwoord* ✓ T_n ✓ *subst* ✓ 37 (3)

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2.1.4	$n = -\frac{b}{2a}$ $= -\left(\frac{-14}{2}\right)$ $= 7$ $\therefore T_7 = 7^2 - 14(7) + 32$ $= 53$	✓ method/*metode* ✓subst into T_n ✓ 53 (3)
2.2.1	$3;\ b;\ 13;\ 18;\ \ldots$ $b - 3 = 13 - b$ $2b = 16 \ \ \therefore \ \ b = 8$	✓ $T_2 - T_1 = T_3 - T_2$ ✓$b = 8$ (2)
2.2.2	$T_n = a + (n-1)d$ $= 3 + (n-1)(5)$ $= 5n - 2$	✓subst ✓answer/*antwoord* (2)
2.2.3	$S_n = \frac{n}{2}[2a + (n-1)d]$ $S_{30} = \frac{30}{2}[2(3) + 29(5)]$ $= 2\,265$ **OR/OF** $T_{30} = 5(30) - 2$ $= 148$ $S_n = \frac{n}{2}(a + l)$ $= \frac{30}{2}(3 + 148)$ $= 2\,265$	✓subst ✓$S_{30} = 2\,265$ ✓$T_{30} = 148$ ✓$S_{30} = 2\,265$ (2)
2.3	$2^x + 2^{x+1} + 3.2^x + 2^{x+2} + \ldots \ (15\ terms)$ $= 2^x + 2.2^x + 3.2^x + 4.2^x + \ldots + 15.2^x$ $a = 2^x;\ d = 2^x$ $S_n = \frac{n}{2}[2a + (n-1)d]$ $S_{15} = \frac{15}{2}[2.2^x + 14.2^x]$ $= 15(8).2^x$ $= 15.2^{x+3}$ $\therefore k = 15;\ p = 3$	✓ $a = 2^x;\ d = 2^x$ ✓ subst ✓ $k = 15$ ✓$p = 3$ (4)

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	OR/OF $S_n = \frac{n}{2}(a+l)$ $S_{15} = \frac{15}{2}(2^x + 15.2^x)$ $= 15.2^3.2^x$ $= 15.2^{x+3}$ $\therefore k = 15;\ p = 3$	✓ $a = 2^x;\ l = 15.2^x$ ✓ subst ✓ $k = 15$ ✓$p = 3$ (4) **[21]**

QUESTION/VRAAG 3

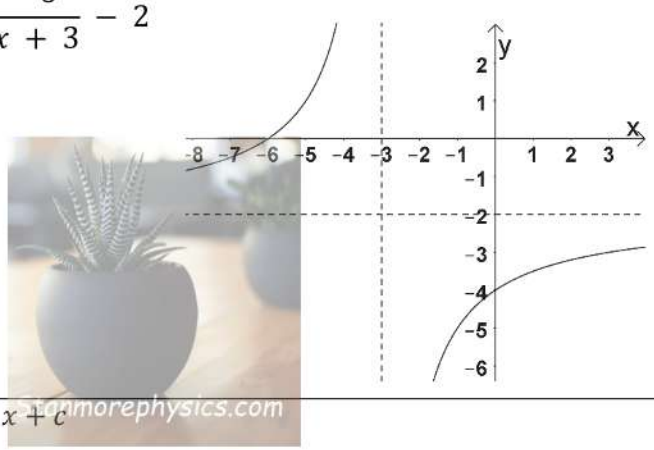
3.1.1	$-4 + 2 - 1 + \ldots + \frac{1}{32}$ $a = -4;\ r = -\frac{1}{2}$ $\therefore T_n = -4.\left(-\frac{1}{2}\right)^{n-1}$	✓ a and r /a en r ✓ T_n (2)
3.1.2	$T_n = -4.\left(-\frac{1}{2}\right)^{n-1}$ $\frac{1}{32} = -4.\left(-\frac{1}{2}\right)^{n-1}$ $-\frac{1}{128} = \left(-\frac{1}{2}\right)^{n-1}$ ***OR*** $n - 1 = \log_{\frac{1}{2}}\left(\frac{1}{128}\right)$ $\left(-\frac{1}{2}\right)^7 = \left(-\frac{1}{2}\right)^{n-1}$ $n - 1 = 7$ $7 = n - 1$ $n = 8$ $\therefore\ n = 8$ $\sum_{n=1}^{8} -4.\left(-\frac{1}{2}\right)^{n-1}$	✓$n = 8$ ✓ answer/*antwoord* (2)
3.1.3	$S_\infty = \frac{a}{1-r}$ $= \frac{-4}{1-(-0{,}5)}$ $= -\frac{8}{3}$	✓subst ✓answer (2)

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3.2.1	$S_n = 32 - 32\left(\frac{1}{2}\right)^n$ $S_5 = 32 - 32\left(\frac{1}{2}\right)^5$ $= 31$	✓ 31 (1)
3.2.2	$a = 16;\ r = \frac{1}{2}$ $\therefore S_n = \frac{a(1-r^n)}{1-r}$ $\frac{255}{8} = \frac{16\left[1-\left(\frac{1}{2}\right)^n\right]}{1-\frac{1}{2}}$ $\frac{255}{256} = 1 - \left(\frac{1}{2}\right)^n$ $\left(\frac{1}{2}\right)^n = \frac{1}{256}$ $2^{-n} = 2^{-8}$ $\therefore \quad n = 8$	✓subst ✓$\left(\frac{1}{2}\right)^n = \frac{1}{256}$ ✓ 8 terms/*terme* (3)
3.2.3	$S_{5-n} - S_{5+n}$ $= \left[32 - 32\left(\frac{1}{2}\right)^{5-n}\right] - \left[32 - 32\left(\frac{1}{2}\right)^{5+n}\right]$ $= 32 - 2^5.2^{-5+n} - 32 + 2^5.2^{-5-n}$ $= -2^n + 2^{-n}$ $= -p + \frac{1}{p}$ ***OR*** $= \frac{-p^2+1}{p}$	✓ subst ✓ $-2^n + 2^{-n}$ ✓ answer/*antwoord* (3) **[13]**

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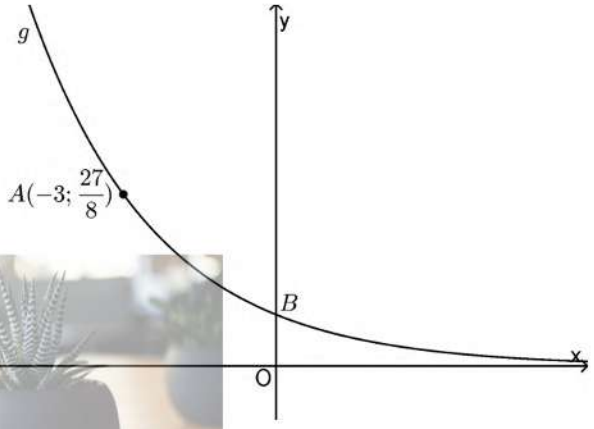
QUESTION/VRAAG 4

4.1	$x = -3$ $y = -2$	✓ ✓ each equation / *elke vgl* (2)
4.2	$h(x) = \frac{-6}{x + 3} - 2$  	✓ $(-6; 0)$ ✓ $(0; -4)$ ✓ asymptotes/*asymptote* ✓ shape/*vorm* (4)
4.3	$y = x + c$ $\therefore\ -2 = -3 + c$ $\therefore\ \ c = 1$ $\therefore y = x + 1$	✓ subst (-3; -2) ✓ equation/*vergelyking* (2)
4.4	$y \neq -2;\ y \in \mathbb{R}$	✓ $y \neq -3$ ✓ $y \in \mathbb{R}$ (2)
4.5	$-6 \leq x < -3$	✓ interval ✓ notation (2) **[12]**

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QUESTION/VRAAG 5

$g(x) = a^x$



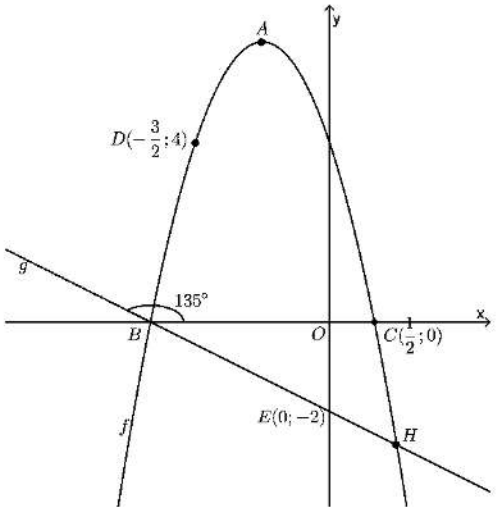
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5.1	B(0; 1)	✓✓(0; 1) (2)
5.2	$g(x) = a^x$ $\frac{27}{8} = a^{-3}$ $\frac{27}{8} = \frac{1}{a^3}$ $a^3 = \frac{8}{27}$ $\therefore \quad a = \frac{2}{3}$	✓ subst $\left(-3; \frac{27}{8}\right)$ ✓ $a = \frac{2}{3}$ (2)
5.3	$h(x) = g(-x) = \left(\frac{2}{3}\right)^{-x}$ $\therefore h(x) = \left(\frac{3}{2}\right)^x$	✓✓ $\left(\frac{2}{3}\right)^{-x}$ **OR** ✓✓ $\left(\frac{3}{2}\right)^x$ (2)
5.4	$y = \log_{\frac{3}{2}} x$	✓ ✓ answer/*antwoord* (2)
5.5	$0 < x \leq \frac{3}{2}$	✓ interval ✓ notation/*notasie* (2)
5.6	$x > 3; x \in \mathbb{R}$	✓✓ (2)
		[12]

QUESTION/VRAAG 6

$f(x) = ax^2 + bx + c$

and/*en* $g(x) = mx + q$



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6.1	$c = -2;$ $m = \tan 135° = -1$ $\therefore y = -x - 2$	✓ $c = -2$ ✓ $m = -1$ (2)
6.2	$\underline{x - \text{intercept } of\ g:\ y = 0}$ $x = -2$ $\therefore B(-2;\ 0)$	✓ $y = 0$ ✓ $(-2;\ 0)$ (2)
6.3	$f:\ y = a(x - x_1)(x - x_2)$ $y = a(x - (-2))(x - \frac{1}{2})$ $4 = a\left(-\frac{3}{2} + 2\right)\left(-\frac{3}{2} - \frac{1}{2}\right)$ $4 = \frac{1}{2}.(-2).a$ $\therefore\ a = -4$ $\therefore f(x) = -4(x + 2)\left(x - \frac{1}{2}\right)$ $= -4x^2 - 6x + 4$	✓ subst roots/*wortels* ✓ subst $\left(-\frac{3}{2};\ 4\right)$ ✓ $a = -4$ ✓ $-4(x + 2)\left(x - \frac{1}{2}\right)$ (4)
6.4	$x = -\frac{b}{2a} = \frac{-(-6)}{2(-4)} = -\frac{3}{4}$ ***OR*** $x = \frac{-2 + \frac{1}{2}}{2} = -\frac{3}{4}$ $f\left(-\frac{3}{4}\right) = -4\left(-\frac{3}{4}\right)^2 - 6\left(-\frac{3}{4}\right) + 4 = \frac{25}{4}$ $\therefore A\left(-\frac{3}{4};\ \frac{25}{4}\right)$	✓ $x = -\frac{3}{4}$ ✓ subst ✓coordinate/*koördinaat* (3)

6.5	$f(x) = g(x)$ $-4x^2 - 6x + 4 = -x - 2$ $4x^2 + 5x - 6 = 0$ $(x + 2)(4x - 3) = 0$ $x = -2 \quad or/of \quad x = \frac{3}{4}$ NA $\quad y = -\left(\frac{3}{4}\right) - 2$ $= -\frac{11}{4}$ $\therefore H\left(\frac{3}{4}; -\frac{11}{4}\right)$	✓ $f(x) = g(x)$ ✓ std form ✓ x values/*waardes* ✓ coordinate/*koördinaat* (4)
6.6	$x < -\frac{3}{4}$	✓✓ answer/*antwoord* (2)
6.7	$4 < k < \frac{25}{4}$	✓ values/*waardes* ✓ notation/*notasie* (2)
6.8	$D\left(\frac{3}{2}; -\frac{9}{4}\right)$	✓ *x*-value/*waarde* ✓ *y*-value/*waarde* (2) **[21]**

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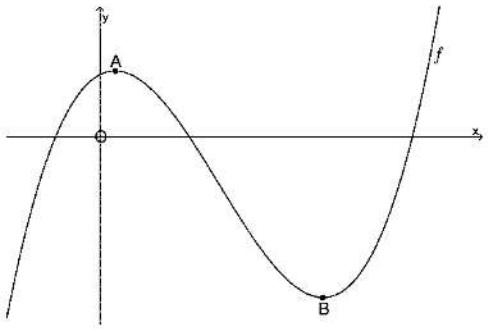
QUESTION/VRAAG 7

7.1	$f(x) = x^2 + 4x + 1$ $f(x + h) = (x + h)^2 + 4(x + h) + 1$ $= x^2 + 2xh + h^2 + 4x + 4h + 1$ $f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$ $= \lim_{h \to 0} \frac{x^2 + 2xh + h^2 + 4x + 4h + 1 - (x^2 + 4x + 1)}{h}$ $= \lim_{h \to 0} \frac{x^2 + 2xh + h^2 + 4x + 4h + 1 - x^2 - 4x - 1}{h}$ $= \lim_{h \to 0} \frac{h(2x + h + 4)}{h}$ $= \lim_{h \to 0} (2x + h + 4)$ $= 2x + 4$	✓answer of $f(x + h)$ /*antwoord van* $f(x + h)$ ✓ subst ✓ simplify/ *vereenv* ✓ common factor/*gemene fakt* ✓ $2x + 4$ (5)
7.2.1	$f(x) = -3x^4 + 5x^2$ $f'(x) = -12x^3 + 10x$	✓ $-12x^3$ ✓ $10x$ (2)

7.2.2	$y = \sqrt{x} - \frac{2}{x}$ $= x^{\frac{1}{2}} - 2x^{-1}$ $\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}} + 2x^{-2}$	✓ $x^{\frac{1}{2}}$ ✓ $2x^{-1}$ ✓ $\frac{1}{2}x^{-\frac{1}{2}}$ ✓$2x^{-2}$ (4)
7.3	$h(x) = -x^3 + 2x - 5$ $h(-2) = -(-2)^3 + 2(-2) - 5$ $= -1$ $h'(x) = -3x^2 + 2$ $h'(-2) = -3(-2)^2 + 2$ $m = -10$ $\therefore y - (-1) = -10(x - (-2))$ $\therefore y = -10x - 21$	✓ subst ✓ subst ✓ $m = -10$ ✓ equation/*vergelyking* (4)
7.4	$x > 1$	✓✓answer/*antwoord* (2) **[17]**

QUESTION/VRAAG 8

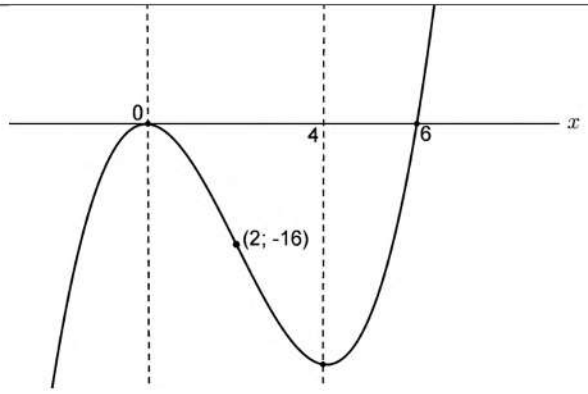
$f(x) = x^3 - 8x^2 + 5x + 14$



8.1	(0; 14)	✓ answer/*antwoord* (1)
8.2	$f(x) = x^3 - 8x^2 + 5x + 14$ $f(7) = 7^3 - 8(7)^2 + 5(7) + 14$ $= 0$	✓ subst ✓ $f(7) = 0$ (2)
8.3	$x^3 - 8x^2 + 5x + 14$ $= (x - 7)(x^2 + kx - 2)$ $= (x - 7)(x^2 - x - 2)$ $= (x - 7)(x - 2)(x + 1)$ $kx^2 - 7x^2 = -8x^2$ $kx^2 = -x^2$ $k = -1$	✓ method/*metode* ✓ $x^2 - x - 2$ ✓ factor/*faktor* $(x - 2)$ ✓ factor/*faktor* $(x + 1)$ (4)

8.4	$f'(x) = 0$ $\therefore \quad 3x^2 - 16x + 5 = 0$ $\therefore (x-5)(3x-1) = 0$ $\therefore x = 5 \ or \ \vert \ of \ x = \frac{1}{3}$ $\therefore f(5) = 5^3 - 8(5)^2 + 5(5) + 14$ $= -36$ $\therefore f\left(\frac{1}{3}\right) = \left(\frac{1}{3}\right)^3 - 8\left(\frac{1}{3}\right)^2 + 5\left(\frac{1}{3}\right) + 14$ $= \frac{400}{27}$ $= 14{,}81$	✓ $f'(x) = 0$ ✓ factors/*faktore* ✓✓ each x-value/*elke x-w* ✓$(5; -36)$ ✓$\left(\frac{1}{3}; \frac{400}{27}\right)$ (6)
8.5	$f''(x) = 0$ $6x - 16 = 0$ $x = \frac{8}{3}$ $f\left(\frac{8}{3}\right) = \left(\frac{8}{3}\right)^3 - 8\left(\frac{8}{3}\right)^2 + 5\left(\frac{8}{3}\right) + 14$ $= -\frac{286}{27}$ $= -10{,}59$ $\therefore \left(\frac{8}{3}; -\frac{286}{27}\right)$	✓ $f''(x) = 0$ ✓ $x = \frac{8}{3}$ ✓ coordinate/*koördinaat* (3) **[16]**

QUESTION/VRAAG 9

	✓ x-intercepts/*afsnitte* ✓ turning points/*draaipunte* ✓ shape/*vorm* ✓ (2; -16)
	[4]

QUESTION/VRAAG 10

10.1	$h(t) = 18t - 4t^2$ $h(2) = 18(2) - 4(2)^2$ $= 20\ m$	✓ subst ✓ 20 m (2)
10.2	$h = 18t - 4t^2$ $h'(t) = 18 - 8t$ $h'(1,5) = 18 - 8(1,5)$ $= 6$ m/s	✓ h'(t) ✓ subst 1,5 ✓ 6 (3)
10.3	$h'(t) = 0$ $18 - 8t = 0$ $\therefore t = 2,25\ s$ $h(2,25) = 18(2,25) - 4(2,25)^2$ $= 20,25\ m$	✓ $h'(t) = 0$ ✓ $t = 2,25\ s$ ✓ subst 2,25 ✓ 20,25 (4)
		[9]

TOTAL/*TOTAAL*: 150

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