

FUNCTIONS REVISION JUNE 2023 P1 MEMO

June 2017 P1

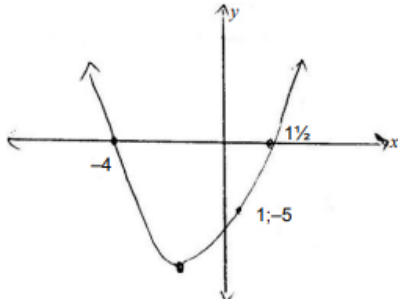
	QUESTION 6	MARKS: 10
6.1	$x = 1$ $y = -2$	$\checkmark x = 1$ $\checkmark y = -2$ (2)
6.2	for x-intercept, make $y = 0$ $0 = \frac{3}{x-1} - 2$ $2 = \frac{3}{x-1}$ $x = 2\frac{1}{2}$ for y-intercept, make $x = 0$ $y = \frac{3}{0-1} - 2$ $y = -5$	$\checkmark y = 0$ $\checkmark x = 2\frac{1}{2}$ $\checkmark y = -5$ (3)

6.3		$\checkmark$ shape $\checkmark$ x and y-intercepts $\checkmark$ asymptotes (3)
6.4	Reflection about the y-axis.	$\checkmark$ reflection $\checkmark$ y-axis (2)

	QUESTION 7	MARKS: 20
7.1.1	$x = \frac{-b}{2a}$ $= \frac{-(8)}{2(2)}$ $= -2$ $D(-2; -5)$	$\checkmark$ corr. sub. in corr. formula $\checkmark$ x-co-ord. - 2 $\checkmark$ y-co-ord. - 5 (if not ordered pair) $\frac{2}{3}$ (3)
7.1.2	$x \geq 0$ or $x \leq -4$	$\checkmark x \geq 0$ $\checkmark x \leq -4$ (incorrect notation) $\frac{1}{2}$ (2)

7.1.3	$LM = k(x) - p(x)$ $= 2x^2 + 8x + 3 - (2x - 4)$ $= 2x^2 + 6x + 7$ $x = \frac{-b}{2a}$ $= \frac{-(6)}{2(2)}$ $= -\frac{3}{2}$ $\text{Min}_{LM} = 2\left(-\frac{3}{2}\right)^2 + 6\left(-\frac{3}{2}\right) + 7$ $= 2\frac{1}{2}$	$\checkmark$ simplification $\checkmark$ corr. sub. in corr. formula $\checkmark$ sub. x in eqn. $\checkmark$ answer (4)
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7.1.4	$\text{Ave. grad} = \frac{k(-2) - k(3)}{-2 - 3}$ $= \frac{-5 - 45}{-2 - 3}$ $= 10$	✓ -5 ✓ -45 ✓ answer (3)
7.1.5	$2x^2 + 8x + 3 = 2x + t$ $2x^2 + 6x + 3 - t = 0$ $\Delta = b^2 - 4ac$ $= (6)^2 - 4(2)(3 - t)$ $= 39 - 24 + 8t$ $= 12 + 8t$ for = roots, $\Delta = 0$ $12 + 8t = 0$ $8t = -12$ $t = -1\frac{1}{2} \text{ or } -\frac{3}{2} \text{ or } -1,5$	✓ std. form ✓ corr. sub. in formula ✓ value of Δ ✓ $\Delta = 0$ ✓ answer (5)

7.2		✓ shape ✓ x-intercepts ✓ turning point in 3 rd quadrant (3)
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QUESTION 5			
5.1	$g(x) = -2(x^2 - 2x) + 16$ $\therefore g(x) = -2(x^2 - 2x + 1 - 1) + 16$ $\therefore g(x) = -2[(x - 1)^2 - 1] + 16$ $\therefore g(x) = -2(x - 1)^2 + 18$ OR $x = \frac{-b}{2a} = \frac{-4}{2(-2)} = 1$ $y = \frac{4ac - b^2}{4a} = 18$ $\therefore TP = (1; 18)$ Subst in $y = a(x + p)^2 + q$ $y = -2(x + 1)^2 + 18$	✓ calculating +1 ✓ -1 ✓ factorizing $(x - 1)^2$ ✓ simplification of $-2[(x - 1)^2 - 1] + 16$ OR $\checkmark x = \frac{-b}{2a} = \frac{-4}{2(-2)} = 1$ $\checkmark y = \frac{4ac - b^2}{4a} = 18$ $\checkmark \therefore TP = (1; 18)$ ✓ substitution (4)	
5.2	Q(1 ; 18)	✓ $x = 1$ ✓ $y = 18$ (2)	
5.3	$-2x^2 + 4x + 16 = 0$ $\therefore x^2 - 2x - 8 = 0$ $\therefore (x - 4)(x + 2) = 0$ $\therefore x = 4 \text{ of } x = -2$ $\therefore D(-2; 0) \text{ and } E(4; 0)$	✓ standard form ✓ factorisation $\checkmark x = 4 \text{ of } x = -2$ $\checkmark D(-2; 0) \text{ and } E(4; 0)$ (4)	

5.4	Vert: $x = -2$ and Hor: $y = 18$ $\therefore p = 2$ and $q = 18$	✓ $x = -2$ ✓ $y = 18$ ✓ $p = 2$ ✓ $q = 18$	(4)
5.5	$x > 1$ OR $x \in (1; \infty)$	✓✓ $x > 1$ OR ✓✓ $x \in (1; \infty)$	(2)
5.6	$y \in (-\infty; 18)$	✓✓ $y \in (-\infty; 18)$	(2)
5.7	$x \in (-\infty; \infty), x \neq -2$ OR $x \in (-\infty; -2) \cup (-2; \infty)$	✓ $x \in (-\infty; \infty)$ ✓ $x \neq -2$ OR ✓ $x \in (-\infty; -2)$ ✓ $(-2; \infty)$	(2)
			[20]

QUESTION 6			
6.1	$f(x) = -2(x - 1)^2 + 8$ $\therefore f(x) = -2(x^2 - 2x + 1) + 8$ $\therefore f(x) = -2x^2 + 4x + 6$ $\therefore b = 4$ and $c = 6$	✓ $p = 1$ ✓ $q = 8$ ✓ $-2x^2 + 4x + 6$ ✓ $b = 4$ ✓ $c = 6$	(5)
6.2	$g(x) = -2(x + 1)^2 + 11$ OR $g(x) = -2(x + 2)^2 + 4(x + 2) + 6 + 3$ $\therefore g(x) = -2x^2 - 4x + 9$	✓ $a = -2$ ✓ $p = 1$ ✓ $q = 11$ OR ✓ $a = -2$ ✓ $b = -4$ ✓ $c = 9$	(3)
			[8]

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QUESTION / VRAAG 4

4.1	$y = f(0)$ $= \frac{-6}{0-3} - 1$ $= 1$ (0 ; 1) ANSWER MUST BE IN COORDINATE FORM / ANTWOORD MOET IN KOÖRDINAATVORM WEES	✓ answer / antwoord (1)
4.2	$0 = \frac{-6}{0-3} - 1$ $1 = \frac{-6}{x-3}$ $x-3 = -6$ $x = -3$ (-3 ; 0) NO PENALTY IF ANSWER NOT IN COORDINATE FORM / GEEN PENALISERING INDIEN ANTWOORD NIE IN KOÖRDINAATVORM IS NIE	✓ simplification / vereenvoudiging ($x - 3 = -6$) ✓ answer / antwoord (2)
4.3	$x = 3$ $y = -1$	✓ x-asymptote / x-asimptoot ✓ y-asymptote / y-asimptoot (2)

4.4		✓ shape / vorm ✓ correct x and y-intercepts / korrekte x en y afsnitte ✓ correct asymptotes / korrekte asimptote (3)
4.5	$-3 < x < 3$	✓ correct answer / korrekte antwoord (1)

4.6	$y = \frac{-6}{-2-3} - 1$ $= \frac{1}{5}$ $m = \frac{1 - \frac{1}{5}}{0 - (-2)}$ $m = \frac{2}{5}$ OR / OF $m = \frac{f(0) - f(-2)}{0 - (-2)}$ $= \frac{1 - \frac{1}{5}}{0 - (-2)}$ $= \frac{2}{5}$ ANY OTHER VALID METHOD / ENIGE ANDER GELIGE METODE	✓ $\frac{1}{5}$ ✓ correct substitution / korrekte vervanging ✓ answer / antwoord OR / OF ✓ $f(0) = 1$ and / en $f(-2) = \frac{1}{5}$ ✓ correct substitution / korrekte vervanging ✓ answer / antwoord (3)
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4.7	$y - y_1 = m(x - x_1)$ $y + 1 = 1(x - 3)$ sub. point / verv. punt (3 ; -1) $y = x - 4$ ANY OTHER VALID METHOD / ENIGE ANDER GELDIGE METODE	✓ $m = 1$ ✓ substituting point correctly / korrekte vervanging van punt ✓ answer / antwoord (3)
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QUESTION / VRAAG 5

5.1	$x = \frac{-b}{2a}$ $= \frac{-(-2)}{2(-1)}$ $x = -1$ $y = -(-1)^2 - 2(-1) + 3$ $= -1 + 2 + 3$ $y = 4$ C (-1 ; 4)	✓ x-ordinate / x-ordinaat ✓ substitute into correct equation / vervanging in korrekte vergelyking ✓ y-ordinate / y-ordinaat (3)
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5.2	$-x^2 - 2x + 3 = 0$ $x^2 + 2x - 3 = 0$ $(x+3)(x-1) = 0$ $x+3 = 0$ or / of $x-1 = 0$ $x = -3$ or / of $x = 1$ $A(-3; 0)$ $B(1; 0)$ $\therefore AB = 4$ units / eenhede	✓ factors / faktore ✓ critical values / kritieke waardes ✓ answer / antwoord
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(3)

5.3	$A(-3; 0)$ $C(-1; 4)$ $m = \frac{\Delta y}{\Delta x}$ $= \frac{4 - 0}{-1 + 3}$ $m = 2$ substituting either point $C(-1; 4)$ or point $A(-3; 0)$ <i>vervang punt $C(-1; 4)$ of punt $A(-3; 0)$ in</i> $y - y_1 = m(x - x_1)$ $y - 4 = 2(x + 1)$ sub. point / verv. punt $C(-1; 4)$ $y = 2x + 6$ ANY OTHER VALID METHOD / ENIGE ANDER GELDIGE METODE	✓ value of m / waarde van m ✓ substitute point into correct equation / <i>vervang punt in korrekte vergelyking</i> ✓ answer / antwoord
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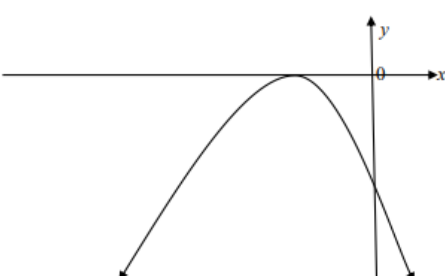
(3)

5.4	$CE^2 = (-1)^2 + (2)^2$ $= 5$ $CE = \sqrt{5}$ OR / OF $C(-1; 4)$ and / en $E(0; 6)$ $CE = \sqrt{(0 + 1)^2 + (6 - 4)^2}$ $= \sqrt{5}$	✓ substitution / vervanging ✓ answer / antwoord OR / OF ✓ substitution in correct formula / <i>vervanging in korrekte formule</i> ✓ answer / antwoord
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(2)

5.5.1	$x = -1$ $x = -3$	✓ answer / antwoord ✓ answer / antwoord
5.5.2	$x > 1$	✓ correct critical value / <i>korrekte kritiese waarde</i> ✓ answer / antwoord

(2)

5.6		✓ shape / vorm ✓ maximum turning point on the x axis to the left of the origin. / <i>maksimum draaipunt op die x-as links van die oorsprong</i>
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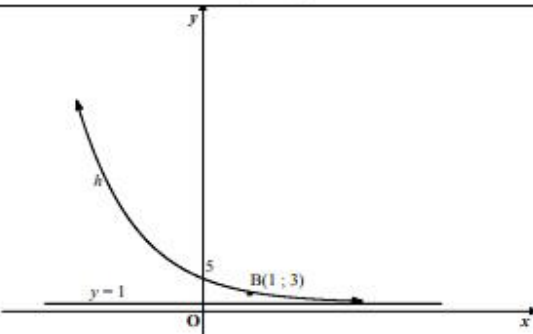
(2)

QUESTION/VRAAG 5

5.1.1	$(1; -2)$	✓ for/vir 1 ✓ for/vir -2 (2)
5.1.2	For x-intercept/Vir x-afsnit: $0 = \frac{-9}{x-1} - 2$ $2 = \frac{-9}{x-1}$ $2(x-1) = -9$ $2x = -7$ $x = -\frac{7}{2} \quad \left(-\frac{7}{2}; 0\right)$ For y-intercept/Vir y-afsnit: $y = \frac{-9}{0-1} - 2$ $= 9 - 2$ $= 7 \quad (0; 7)$	✓ $y = 0$ ✓ simplification/vereenv ✓ answer/antwoord ✓ $x = 0$ ✓ answer/antwoord (5)
5.1.3	$y = -x - 1$	✓ $-x$ ✓ -1 (2)

5.1.4	Closest point is a point of intersection between the axis of symmetry and the hyperbola/Naaste punt is 'n snypunt tussen die simmetrie-as en die hiperbool: $-x-1 = \frac{-9}{x-1} - 2$ $-x+1 = \frac{-9}{x-1}$ $x-1 = \frac{9}{x-1}$ $(x-1)^2 = 9$ $x-1 = 3 \quad \text{or} \quad x-1 = -3$ $x = 4 \quad \quad \quad x = -2$ in the fourth quadrant, $x > 0$, hence $x = 4$ only $y = -4 - 1$ $y = -5$ Point/Punt is $(4; -5)$	✓ equating/vgl ✓ $(x-1)^2 = 9$ ✓ answers for/antwoord vir x ✓ selects $x = 4$ only/ kies slegs $x = 4$ ✓ answer for/antwoord vir y (5)
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5.1.5	$y = \frac{9}{x-1} + 2$	✓ $\frac{9}{x-1}$ ✓ $+2$ (2)
5.2.1	For y-intercept/Vir y-afsnit substitution $x = 0$: $y = 4 \cdot 2^0 + 1$ $= 5$ $H(0; 5)$	✓ $x = 0$ substitution into the equation/in die vgl ✓ $y = 5$ (2)

5.2.2	For x-intercept/Vir y-afsnit $y = 0$ i.e./d.i. $4 \cdot 2^{-x} + 1 = 0$ $4 \cdot 2^{-x} = -1$ $2^{-x} = -\frac{1}{4}$, which is impossible, since $2^{-x} > 0$ for $x \in R$, wat onmoontlik is omdat $2^{-x} > 0$ vir $x \in R$ Therefore/Dus: no solution/geen oplossing, which means there will be no x-intercept/wat beteken daar sal geen x-afsnit wees nie. OR/OF The graph lies above its asymptote $y = 1$ because the coefficient of 2^{-x} is 4/Die grafiek lê bokant sy asimptoot $y = 1$ want die koëffisiënt van 2^{-x} is 4. OR/OF The range is $(1; \infty)$ or $y > 1$ Die waardeversameling is $(1; \infty)$ of $y > 1$	✓ $4 \cdot 2^{-x} + 1 = 0$ ✓ $2^{-x} = -\frac{1}{4}$ and explanation/ en verduideliking (2) ✓ above/bokant ✓ $y = 1$ (2) ✓✓ correct range/korrekte waardeversameling (2)
5.2.3		✓ shape/vorm ✓ y-intercept and other point/ y-afsnit en ander punt ✓ asymptote/asimptoot (3)
5.2.4	$g(x) = 4(2^{-x} + 2)$ $= 4 \cdot 2^{-x} + 8$ The graph of h is translated 7 units upwards to form g/ Die grafiek van h word 7 eenhede na bo getransleer om g te vorm.	✓ 7 units/eenhede ✓ upwards/opwaarts (2) [25]

QUESTION/VRAAG 6

6.1	$y = a(x - 2)^2 + 9$ Substitution $(0; 5)$: $5 = a(0 - 2)^2 + 9$ $5 = 4a + 9$ $a = -1$ $y = -1(x - 2)^2 + 9$ $= -(x^2 - 4x + 4) + 9$ $= -x^2 + 4x + 5$	✓ substitution coordinates of TP ✓ substitution of/van $(0; 5)$ ✓ value of/waarde van a ✓ simplification/vereenv (4)
6.2	Average Gradient $= \frac{9-5}{2-0}$ or $\frac{5-9}{0-2}$ $= 2$	✓ $\frac{9-5}{2-0}$ or $\frac{5-9}{0-2}$ ✓ answer/antwoord (2)

6.3	<i>x</i>-intercepts of/<i>x</i>-afsnitte van <i>f</i>: $\frac{1}{2}x^2 - 8 = 0$ $x^2 = 16$ $x = 4 \text{ or } -4$ At/By B: $x = -4$ <i>x</i>-intercepts of/<i>x</i>-afsnitte van <i>g</i>: $-x^2 + 4x + 5 = 0$ $x^2 - 4x - 5 = 0$ $(x - 5)(x + 1) = 0$ $x = -1 \text{ or } 5$ At/By D: $x = 5$ Length of/<i>Lengte</i> van BD: $4 + 5 = 9$	✓ $\frac{1}{2}x^2 - 8 = 0$ ✓ -4 ✓ factors/<i>faktore</i> ✓ 5 ✓ answer/<i>antwoord</i> (5)
6.4.1	$x \leq -4 \text{ or } x \geq 4$	✓ $x \leq -4$ ✓ $x \geq 4$ (2)
6.4.2	$0 < x < 2$	✓ endpoints/<i>eindpunte</i> ✓ notation/<i>notasie</i> (2)

[15]

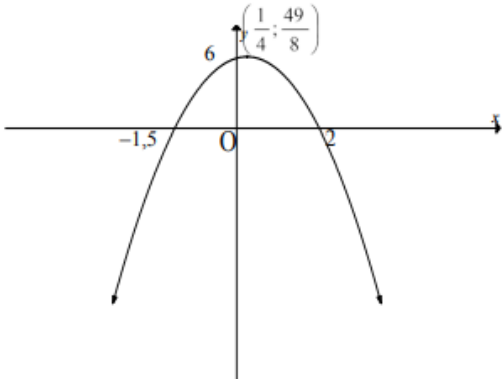
QUESTION/VRAAG 7

7.1	$CD = 2x + 3 - (-2x^2 + 14x + k)$ $= 2x + 3 + 2x^2 - 14x - k$ $= 2x^2 - 12x + 3 - k$	✓✓ $f(x) - g(x)$ ✓ answer/<i>antwoord</i> (3)
7.2	Minimum value occurs at/<i>Minimum waarde vind plaas by</i> $x = \frac{-b}{2a}$ $= \frac{12}{2(2)}$ $= 3$ Minimum value/<i>Minimum waarde</i> $5 = 2(3)^2 - 12(3) + 3 - k$ $5 = 18 - 36 + 3 - k$ $k = -20$ OR/OF $CD = 2x^2 - 12x + 3 - k$ $= 2(x^2 - 6x) + 3 - k$ $= 2[(x - 3)^2 - 9] + 3 - k$ $= 2(x - 3)^2 - 18 + 3 - k$ $= 2(x - 3)^2 - 15 - k$ Hence the minimum value of CD is $-15 - k$ The minimum value of CD is given to be 5 <i>Vervolgens is die minimum waarde van CD $-15 - k$</i> <i>Die minimum waarde van CD is gegee as 5</i> $5 = -15 - k$ $k = -20$	✓ $x = \frac{-b}{2a}$ ✓ <i>x</i>-value for minimum <i>x-waarde vir minimum</i> ✓ subst 5 ✓ answer/<i>antwoord</i> (4) ✓ $2(x - 3)^2$ ✓ $CD = 2(x - 3)^2 - 15 - k$ ✓ $5 = -15 - k$ ✓ answer/<i>antwoord</i> (4)

[7]

QUESTION 5

5.1	$x = -\frac{b}{2a}$ $= -\frac{1}{2(-2)}$ $= \frac{1}{4}$ $\therefore y = -2\left(\frac{1}{4}\right)^2 + \left(\frac{1}{4}\right) + 6$ $y = \frac{49}{8}$	✓ substitution/verv. ✓ x-value/wrde ✓ substitution/verv. ✓ y-value/wrde (4)
5.2	$y = -2(0)^2 + 0 + 6$ $\therefore y \text{ intercept } (0;6)$	✓ y-value/wrde (1)
5.3	x intercepts $0 = -2x^2 + x + 6$ $0 = 2x^2 - x - 6$ $0 = (2x + 3)(x - 2)$ $\therefore x = 2 \text{ or } x = -\frac{3}{2}$ $(2;0) \text{ and } \left(-\frac{3}{2};0\right)$	✓ $y = 0$ ✓ factorisation/fakt. ✓ ✓ x-values/wrde (4)

5.4		✓ shape/vorm ✓ intercepts/afsnitte ✓ turning point/drpnt (3)
5.5	$k = \frac{49}{8}$	✓ ✓ answer/antw. (2)
5.6	New/Nuwe turning point/drpnt $\left(\frac{9}{4}; \frac{57}{8}\right)$ Equation/verg. of h $y = -2\left(x - \frac{9}{4}\right)^2 + \frac{57}{8}$	✓ ✓ turning points/drpnt ✓ equation/verg. (3) OR/OF ✓ ✓ ✓ answer only (3) [17]

QUESTION/VRAAG 6

6.1	$x = -3$ and $y = -1$	✓ $x = -3$ ✓ $y = -1$ (2)
6.2	$x \in \mathbb{R}; x \neq -3$	✓ ✓ answer/antw. (2)
6.3.1	At B, $x = 0$ $\therefore y = \frac{1}{0+3} - 1$ $y = -\frac{2}{3}$ $\therefore OB = \frac{2}{3} \text{ units}$	✓ substituton/verv. ✓ answer/antw. (2)

6.3.2	At A, $y = 0$ $0 = \frac{1}{x+3} - 1$ $1 = \frac{1}{x+3}$ $x+3 = 1$ $x = -2$ $\therefore OA = 2$ units	✓ substitution/<i>verv.</i> ✓ simplification/<i>vereenv.</i> ✓ answer/<i>antw.</i> (3)
6.4	$\frac{1}{x+3} - 1 = \frac{1}{2}x$ $2 - 2(x+3) = x(x+3)$ $x^2 + 3x - 2 + 2x + 6 = 0$ $x^2 + 5x + 4 = 0$ $(x+4)(x+1) = 0$ $x = -4 \text{ or } x = -1$ when $x = -1$; $y = -\frac{1}{2}$ when $x = -4$; $y = -2$ $\therefore C(-1; -\frac{1}{2})$ and $D(-4; -2)$	✓ equating the two equations/ <i>verg. van 2 vergelykings</i> ✓ std vorm/<i>std vorm</i> ✓ factors/<i>fakt.</i> ✓ x-values/<i>wrds</i> ✓ co-ordinates/<i>koörd</i> of C ✓ co-ordinates/<i>koörd</i> of D (6)
6.5	$\frac{1}{x+3} \geq \frac{x+2}{2}$ $\frac{1}{x+3} \geq \frac{x}{2} + 1$ $\frac{1}{x+3} - 1 \geq \frac{x}{2}$ $\therefore f(x) \geq g(x)$ $\therefore x \leq 4 \text{ or } -3 < x \leq -1$	✓ simplification/<i>vereen</i> ✓ $f(x) \geq g(x)$ ✓ $x \leq -4$ ✓ $-3 < x \leq -1$ (4) [19]

6.5	Average/Gemid. gradient = gradient of/van g = 1	✓ answer/antw. (1)
6.6	$f(x) = -\left(x + \frac{1}{2}\right)^2 + \frac{25}{4}$ $h(x) = \left(x + \frac{1}{2} - 3\right)^2 - \frac{25}{4}$ $h(x) = \left(x - \frac{5}{2}\right)^2 - \frac{25}{4}$ OR/OF $f(x) = -x^2 - x + 6$ $h(x) = (x-3)^2 + (x-3) - 6$ $h(x) = x^2 - 5x$ $h(x) = \left(x - \frac{5}{2}\right)^2 - \frac{25}{4}$	$\checkmark f(x) = -\left(x + \frac{1}{2}\right)^2 + \frac{25}{4}$ $\checkmark \left(x - \frac{5}{2}\right)^2$ $\checkmark -\frac{25}{4}$ (3) $\checkmark h(x) = (x-3)^2 + (x-3) - 6$ $\checkmark \left(x - \frac{5}{2}\right)^2$ $\checkmark -\frac{25}{4}$ (3)
6.7	$-3 < x < 2$ OR/OF $x \in (-3; 2)$	$\checkmark\checkmark$ answer/antw. (2) $\checkmark\checkmark$ answer/antw. (2)

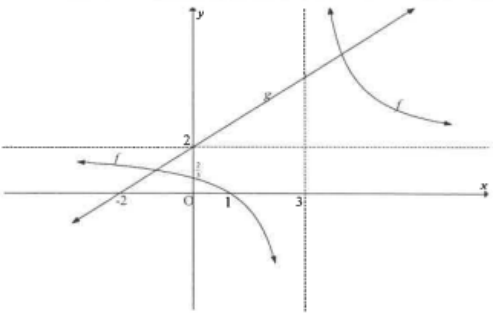
6.8	$r = -2$ By symmetry/deur simmetrie $p = 1$ $p - r = 3$ OR/OF $-x^2 - x + 6 = 4$ $-x^2 - x + 2 = 0$ $x^2 + x - 2 = 0$ $(x+2)(x-1) = 0$ $x = -2$ or / of $x = 1$ $r = -2$ $p = 1$ $p - r = 3$	$\checkmark r = -2$ $\checkmark\checkmark p = 1$ $\checkmark$ answer/antw. (4) $\checkmark r = -2$ $\checkmark\checkmark p = 1$ $\checkmark$ answer/antw. (4)
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QUESTION/VRAAG 5

5.1	$x = 3$ $y = 2$	$\checkmark x = 3$ $\checkmark y = 2$ (2)
5.2	$0 = \frac{4}{x-3} + 2$ $-2 = \frac{4}{x-3}$ $-2(x-3) = 4$ $-2x + 6 = 4$ $x = 1$ OR/OF (1; 0)	$\checkmark$ subst./verv. $y = 0$ $\checkmark$ simplification/vereenv. $\checkmark$ answer/antw. (3) $\checkmark\checkmark\checkmark$ answer/antw (3)

5.3	$y = \frac{4}{0-3} + 2$ $= \frac{2}{3}$ OR/OF $\left(0, \frac{2}{3}\right)$	✓ subst/verv. $x = 0$ ✓ answer/antw. (2) ✓ ✓ answer/antw (2)
5.4		For/Vir f ✓ asymptotes/asimptote ✓ shape/vorm ✓ x- and y- int. /afsnit For/Vir g ✓ x-int./afsnit ✓ y-int./afsnit (5)

5.5	$\frac{4}{x-3} + 2 = x + 2$ $\frac{4}{x-3} = x + 2 - 2$ $\frac{4}{x-3} = x$ $x(x-3) = 4$ $x^2 - 3x - 4 = 0$ $(x-4)(x+1) = 0$ $x = 4 \text{ or } x = -1$	$\checkmark \frac{4}{x-3} + 2 = x + 2$ ✓ std vorm/stand. vorm ✓ factors/faktore ✓ answers/antw. (4)
5.6	$-1 < x < 3$	✓ ✓ answer/antwoord (2)
5.7	$y = x + c$ $2 = (3) + c$ $-1 = c$ $\therefore y = x - 1$ Is an axis of symmetry of/ <i>simmetrie-as van f</i> $Q(\sqrt{4} + 3; \sqrt{4} + 2) = Q(5; 4)$ OR/ OF	$\checkmark Q(\sqrt{4} + 3; \sqrt{4} + 2)$ ✓ 5 ✓ 4 (3)

$x - 1 = \frac{4}{x-3} + 2$ $x - 3 = \frac{4}{x-3}$ $(x-3)^2 = 4$ $x^2 - 6x + 5 = 0$ $(x-5)(x-1) = 0$ $x = 5 \text{ or } x = 1$ $y = 5 - 1 = 4$ $Q(5; 4)$	✓ equating / vergelyk ✓ 5 ✓ 4 (3) [21]
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Nov 2021 P1 Exemplar

QUESTION 5

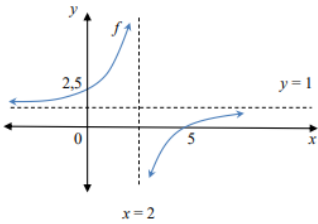
5.1.1	$x=2$ and $y=3$	$\checkmark$ $x=2$ $\checkmark$ $y=3$ (2)
5.1.2	$y = \frac{a}{x-2} + 3$ $(1;0): 0 = \frac{a}{1-2} + 3$ $0 = -a + 3$ $a = 3$ $f(x) = \frac{3}{x-2} + 3$	$\checkmark\checkmark$ substituting (1;0) and (2;3) $\checkmark$ value of a $\checkmark$ $f(x) = \frac{3}{x-2} + 3$ (4)
5.1.3	D:y-int let $x=0$ $y = \frac{3}{(0)-2} + 3$ $y = -\frac{3}{2} + 3$ $y = \frac{3}{2}$ $D\left(0; \frac{3}{2}\right)$	$\checkmark$ letting $x=0$ $\checkmark$ $x=0$ $\checkmark$ $y = \frac{3}{2}$ (3)

5.1.4	$m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \frac{3 - \frac{3}{2}}{2 - 0}$ $m = \frac{3}{4}$ $y = mx + c$ $y = \frac{3}{4}x + \frac{3}{2}$	$\checkmark$ Substituting correct points into the gradient formula $\checkmark$ $m = \frac{3}{4}$ $\checkmark$ $y = \frac{3}{4}x + \frac{3}{2}$ (3)
5.1.5	Domain: $x \in \mathbb{R}$ but $x \neq 2$ Range: $y \in \mathbb{R}$ but $y \neq 3$	$\checkmark$ domain $\checkmark$ range (2)
		[14]

QUESTION 7

7.1.1	$CD = g(x) - f(x)$ $= x + 4 - (x^2 + 3x - 4)$ $= x + 4 - x^2 - 3x + 4$ $= -x^2 - 2x + 8$ Sub $x = -2$ into CD 2 $\therefore CD = 8 \text{ units}$	✓ equating $f(x)$ and $g(x)$ ✓ $x^2 - 2x + 8$ ✓ $CD = 8 \text{ units}$
7.1.2	x-int: let $y = 0$ $\therefore x^2 + 3x - 4 = 0$ $(x + 4)(x - 1) = 0$ $\therefore x = -4 / x = 1$ $A(-4; 0)$ and $B(1; 0)$	✓ $x^2 + 3x - 4 = 0$ ✓ coordinates of A ✓ coordinates of B
7.1.3	$f(x) = g(x)$ $x^2 + 3x - 4 = x + 4$ $x^2 + 2x - 8 = 0$ $(x - 2)(x + 4) = 0$ $x = 2 / x = -4$ Sub $x = 2$ into $g(x)$ $g(2) = 2 + 4$ $g(2) = 6$ $P(2; 6)$	✓ equating $f(x)$ and $g(x)$ ✓ factors ✓ coordinates of P
7.1.4	$f(x) \geq 0$ $x \leq -4 / x \geq 1$	✓✓ solutions
7.1.5	$f(x) \leq g(x)$ $-4 \leq x \leq 2$ Or $x \in [-4; 2]$	✓✓ solutions
7.1.6	$f(x) \cdot g(x) > 0$ $x > 1$	✓✓ solutions
		[15]

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QUESTION 5		
5.1	$y = \frac{-3}{0-2} + 1$ $= \frac{3}{2} + 1$ $= 2,5$ or $y = \frac{5}{2}$ $\therefore (0; 2,5)$ or $(0; \frac{5}{2})$	✓ $x = 0$ ✓ $y = 2,5$ or $y = \frac{5}{2}$ (2)
5.2	$0 = \frac{-3}{x-2} + 1$ $-1 = \frac{-3}{x-2}$ $x - 2 = 3$ $x = 5$ $\therefore (5; 0)$	✓ $y = 0$ ✓ $x = 5$ (2)
5.3		✓ shape ✓ both intercepts ✓ both asymptotes (3)

5.4	$x \in \mathbb{R}; x \neq 2$ OR $x < 2$ or $x > 2$ OR $x \in (-\infty; 2) \cup x \in (2; \infty)$	$\checkmark x \in \mathbb{R}$ $\checkmark x \neq 2$ (2) $\checkmark x < 2; \checkmark x > 2$ (2) $\checkmark x \in (-\infty; 2)$ $\checkmark x \in (2; \infty)$ (2)
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5.5	$h(x) = \frac{-3}{x-5} - 3$ OR $h(x) \Rightarrow f(x-2) - 4 = \frac{-3}{x-3-2} + 1 - 4 \Rightarrow \therefore h(x) = \frac{-3}{x-5} - 3$	$\checkmark \frac{-3}{x-5}$ $\checkmark -3$ (2)
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5.6	From the graph of h: $5 < x \leq 8$ or $x \in (5; 8]$ OR From translations: $h(x) \leq -4 \therefore f(x) \leq 0$ (4 units up) If $f(x) \leq 0$, then $2 < x \leq 5$ $\therefore$ for $h(x)$: $5 < x \leq 8$ (3 units to the right)	$\checkmark (8; -4)$ $\checkmark 5 < x$ $\checkmark x \leq 8$ (3) $\checkmark f(x) \leq 0$ $\checkmark f(x): 2 < x \leq 5$ $\checkmark h(x): 5 < x \leq 8$ (3)
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5.7	$j(x) = \frac{3x-5}{x-1}$ By dividing $x-1$ into $3x-5$: $j(x) = \frac{-2}{x-1} + 3$ $\therefore$ The asymptotes are: $x=1$ and $y=3$ OR $j(x) = \frac{3x-5}{x-1}$ $j(x) = \frac{3(x-1)-2}{x-1}$ $j(x) = 3 - \frac{2}{x-1}$ $\therefore$ The asymptotes are: $x=1$ and $y=3$	$\checkmark j(x) = \frac{-2}{x-1} + 3$ $\checkmark x=1$ $\checkmark y=3$ (3) $\checkmark j(x) = \frac{-2}{x-1} + 3$ $\checkmark x=1$ $\checkmark y=3$ (3)
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