MARKING GUIDELINE FUNCTIONS AND INVERSES

MAY/JUNE 2024

QUESTION5/*VRAAG* 5
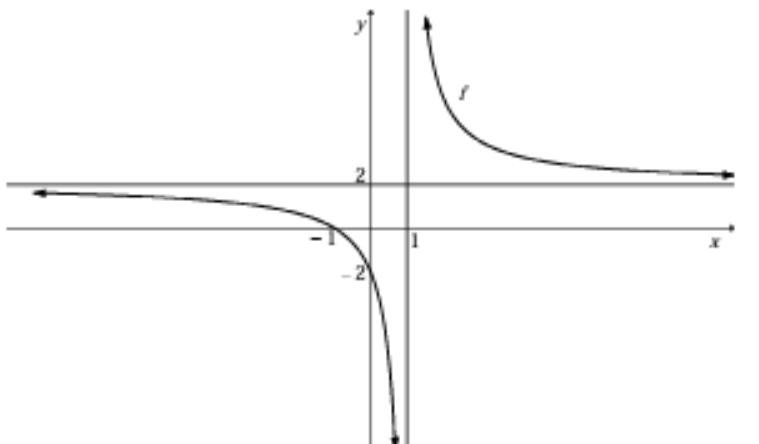
5.1	$P'(2;4)$	$\checkmark x = 2$ $\checkmark y = 4$ (2)
5.2	$f(x) = \log_a x$ $2 = \log_a 4$ $a^2 = 4$ $a = 2$	$\checkmark$ substitute $(4 ; 2)$ $\checkmark a^2 = 4$ (2)
5.3	$y = 2^x$	$\checkmark y = 2^x$ (1)
5.4	$1 = \log_2 x$ $\therefore x = 2 \qquad T(2;1)$ $RT = 2$ units $P'T = 3$ units Area of $\triangle RTP' = \dfrac{1}{2}.RT.TP'$ $= \dfrac{1}{2} \times 2 \times 3 = 3$ units ^{2}	$\checkmark x = 2$ $\checkmark RT = 2$ units $\checkmark P'T = 3$ units $\checkmark$ answer (4)
		[9]

QUESTION 4/ *VRAAG* 4

4.1	$y = -4$	✓ $y = -4$	(1)
4.2	x – intercept: $0 = 2^x - 4$ $4 = 2^x$ $x = 2$ $\therefore B(2;0)$	✓ $y = 0$ ✓ $x = 2$	(2)
4.3	$y = 2^0 - 4 = -3$ $\therefore A(0;-3)$ $y = mx + c$ $m = \dfrac{3}{2}$ $k(x) = \dfrac{3}{2}x - 3$	✓ $y = -3$ ✓ gradient ✓ equation	(3)
4.4	$k(1) = \dfrac{3}{2}(1) - 3 = \dfrac{-3}{2}$ $f(1) = 2^1 - 4 = -2$ Vertical distance $= -\dfrac{3}{2} - (-2) = \dfrac{1}{2}$ units	✓ $k(1)$ ✓ $f(1) = -2$ ✓ answer	(3)
4.5	$g(x) = f(x) + 4$ $g(x) = 2^x$; $x \in [-2 ; 4)$	✓ $g(x) = 2^x$	(1)
4.6	Range of g: $y \in \left[\dfrac{1}{4} ; 16\right)$ Domain of g^{-1} : $x \in \left[\dfrac{1}{4} ; 16\right)$ or/*of* $\dfrac{1}{4} \leq x < 16$	✓✓ $x \in \left[\dfrac{1}{4} ; 16\right)$	(2)
4.7	$g: y = 2^x$ $g^{-1}: x = 2^y$ $g^{-1}(x) = \log_2 x,\ x \in \left[\dfrac{1}{4} ; 16\right)$	✓ swop x and y ✓ equation	(2)
			[14]

QUESTION 4/ *VRAAG* 4

4.1.1	decreasing	✓ decreasing	(1)
4.1.2	$y = \left(\dfrac{1}{3}\right)^x$ $x = \left(\dfrac{1}{3}\right)^y$ $\therefore y = \log_{\frac{1}{3}} x$ **OR/OF** $y = 3^{-x}$ $x = 3^{-y}$ $\therefore y = -\log_3 x$	✓ swop x and y ✓ answer **OR/OF** ✓ swop x and y ✓ answer	(2) **OR/OF** (2)
4.1.3	$x > 0; x \in R$	✓ answer	(1)
4.1.4	$y = -5$	✓ answer	(1)
4.2.1	$x = 1$ $y = 2$	✓ $x = 1$ ✓ $y = 2$	(2)
4.2.2	$\dfrac{4}{x-1} + 2 = 0$ $4 = -2x + 2$ $2x = -2$ $x = -1$	✓ let $y = 0$ ✓ $x = -1$	(2)

4.2.3		✓ asymptotes ✓ x-intercept ✓ y-intercept ✓ shape　　(4)
4.2.4	$\dfrac{4}{x-1} \geq -2$ $\dfrac{4}{x-1} + 2 \geq 0$ $x \leq -1$ 　or　 $x > 1$	✓ $x \leq -1$ ✓ $x > 1$　(2)
4.2.5	$y = -x + c$ $2 = -3 + c$ $c = 5$ $y = -x + 5$ **OR/OF** $y = -x + c$ $2 = -1 + c$ $c = 3$ $y = -x + 3$ $y = -(x-2) + 3$ $y = -x + 5$ **OR/OF** $y = -(x + p) + q$ $y = -((x-2) + (-1)) + 2$ $y = -x + 5$	✓ intersection of axes at (3 ; 2) ✓ subst (3 ; 2) and $m = -1$ ✓ $y = -x + 5$　(3) **OR/OF** ✓✓ $-(x-2) + 3$ ✓ $y = -x + 5$　(3) **OR/OF** ✓✓ $y = -((x-2) + (-1)) + 2$ ✓ $y = -x + 5$　(3)
		[18]

4.2.1	$y = -5$	✓ answer	(1)
4.2.2	$x = \dfrac{-b}{2a} = \dfrac{-(-4)}{2(1)} = 2$ $f(2) = 2^2 - 4(2) - 5 = -9$ $\therefore D(2; -9)$ **OR/OF** $f'(x) = 2x - 4$ $2x - 4 = 0$ $\quad x = 2$ $f(2) = 2^2 - 4(2) - 5 = -9$ $\therefore D(2; -9)$	✓ $x = 2$ ✓ $y = -9$ (2) **OR/OF** ✓ $x = 2$ ✓ $y = -9$ (2)	

4.2.3	$q = -5$ $-9 = a(2)^2 - 5$ $-4 = 4a$ $a = -1$ $\therefore g(x) = -2^x - 5$	✓ $q = -5$ ✓ substitution of $(2; -9)$ ✓ $a = -1$ (3)
4.2.4	$y \in (-\infty; -5)$ OR $y < -5; y \in R$	✓ answer (1)
4.2.5	$k < -9$	✓ -9 ✓ $k < -9$ (2)
		[20]

QUESTION 5/VRAAG 5

5.1	$g(x) = 2x + 6$ $y = 6$	✓ $y = 6$	(1)
5.2	$y = 2x + 6$ $x = 2y + 6$ Answer only: Full marks $y = \dfrac{1}{2}x - 3$	✓ swop x and y ✓ equation	(2)
5.3	$\dfrac{1}{2}x - 3 = 2x + 6$ $x - 6 = 4x + 12$ $3x = -18$ $x = -6$ A $(-6; -6)$ **OR/OF** $2x + 6 = x$ $x = -6$ $y = -6$	✓ equating ✓ $x = -6$ ✓ $y = -6$ **OR/OF** ✓ equating ✓ $x = -6$ ✓ $y = -6$	(3) (3)
5.4	$AB = \sqrt{(6)^2 + (12)^2}$ $= \sqrt{180} = 6\sqrt{5} = 13,42$	✓ substitution ✓ answer	(2)

QUESTION/*VRAAG* 6
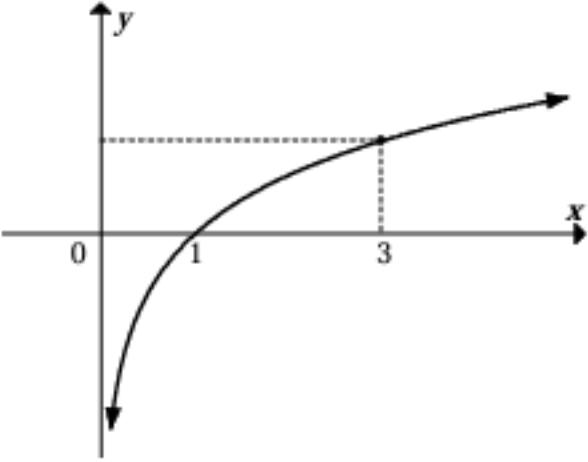
6.1.1	$y = 3^x$ $x = 3^y$ $y = \log_3 x$	✓ swop x and y ✓ equation (2)
6.1.2	$h(x) = 3^{x-4} + 2$ Transformation: 4 units left, 2 units down $P'(2;9)$	✓ $x = 2$ (A) ✓ $y = 9$ (A) (2)
6.2	$f(x) = 2^{x+p} + q$ $q = -16$ $16 = 2^{p+3} - 16$ $2^{p+3} = 32$ $2^{p+3} = 2^5$ $\therefore p + 3 = 5$ $p = 2$	✓ $q = -16$ ✓ substitute $(3;16)$ ✓ $2^{p+3} = 2^5$ or $p+3 = \log_2 32$ ✓ $p = 2$ (4)
		[8]

NOV 2018

QUESTION/*VRAAG* 4

4.1	Yes For every x-value there is only one corresponding y value **OR/OF** One to one mapping (vertical line test)	✓ answer ✓ reason (2)
4.2	R$(-12 ; -6)$	✓ answer (1)
4.3	$f(x) = ax^2$ substitute $(-6 ; -12)$ $-12 = a(-6)^2$ $a = \dfrac{-1}{3}$	✓ substitution ✓ answer (2)
4.4	$f : y = -\left(\dfrac{1}{3}\right)x^2$ $f^{-1} : x = -\left(\dfrac{1}{3}\right)y^2$ $y^2 = -3x$ $y = \pm\sqrt{-3x}$ Only $y = -\sqrt{-3x}$ and $x \le 0$	 ✓ swapping x and y ✓ $y^2 = -3x$ ✓ $y = -\sqrt{-3x}$ (3)
		[8]

QUESTION/*VRAAG* 5

5.1	$a^0 = 1$ T(0 ; 1)	✓ $x = 0$ ✓ $y = 1$ (2)
5.2	$g(x) = a^x$ $9 = a^2$ $a = 3 \qquad a > 0$	✓ substitution ✓ $a = 3$ (2)
5.3	$y = \left(\dfrac{1}{3}\right)^x$ or $y = 3^{-x}$	✓✓ $y = \left(\dfrac{1}{3}\right)^x$ (2)
5.4	$3^0 < 3^{\log_3 x} < 3^1$ $1 < x < 3$ **OR** $1 < x < 3$	✓ $1 < x$ ✓ $x < 3$ (2) ✓ $1 < x$ ✓ $x < 3$ (2) **[8]**

JUNE 2018

QUESTION/*VRAAG* 6

6.1	$q = 1$	✓ $q = 1$
		(1)
6.2	Subs $(0;0)$ $0 = \dfrac{a}{0+p} + 1$ $\dfrac{a}{p} = -1$ $a = -p$ Subs P: $\sqrt{2} + 1 = \dfrac{a}{\sqrt{2} + 2 + p} + 1$ $\sqrt{2} = \dfrac{a}{\sqrt{2} + 2 + p}$ $2 + 2\sqrt{2} + \sqrt{2}\,p = a$ $2 + 2\sqrt{2} = a - p\sqrt{2} = a + a\sqrt{2}$ $2(1+\sqrt{2}) = a(1+\sqrt{2})$ $a = 2 \ ; \ p = -2$ NOTE: Answer only 2 / 5	✓ $0 = \dfrac{a}{0+p} + 1$ ✓ $a = -p$ ✓ substitution ✓ $a = 2$ ✓ $p = -2$ (5)
6.3		✓ $y = 1$ ✓ $x = 2$ ✓ shape ✓ $(0 ; 0)$ (4) **[10]**