Grade 12

Past Paper Question

June 2019

QUESTION 4

Given the exponential function: $g(x) = \left(\dfrac{1}{2}\right)^x$

4.1	Write down the range of g.	(1)

4.2   Determine the equation of g^{-1} in the form $y = \ldots$ (2)

4.3   Is g^{-1} a function? Justify your answer.   (2)

4.4   The point $M(a \, ; 2)$ lies on g^{-1}.

         4.4.1   Calculate the value of a.   (2)

         4.4.2 $M^{/}$, the image of M, lies on g. Write down the coordinates of $M^{/}$.   (1)

4.5   If $h(x) = g(x + 3) + 2$, write down the coordinates of the image of $M^{/}$ on h.   (3)

                                                               [11]

MEMO

QUESTION/VRAAG 4

4.1	$y > 0$	✓answer (1)
	OR/OF	**OR/OF**
	$y \in (0\ ;\ \infty)$	✓answer (1)

4.2	$g: y = \left(\dfrac{1}{2}\right)^x$	
	$g^{-1}: x = \left(\dfrac{1}{2}\right)^y$	✓ $x = \left(\dfrac{1}{2}\right)^y$
	$y = \log_{\frac{1}{2}} x$ or $y = -\log_2 x$ or $y = \log_2 \dfrac{1}{x}$	✓ equation (2)

4.3	Yes. The vertical line test cuts g^{-1} once *Ja. Die vertikale lyn toets sny g^{-1} slegs eenkeer.*	✓ yes ✓ valid reason (2)
	OR/OF Yes. For every x-value there is a unique y-value *Ja. Vir elke x-waarde is daar 'n unieke y-waarde*	**OR/OF** ✓ yes ✓ valid reason (2)
	OR/OF Yes. g is a one-to-one function / *Ja. g is 'n een-tot-een funksie*	**OR/OF** ✓ yes ✓ valid reason (2)
	OR/OF Yes. The horizontal line cuts g only once *Ja. Die horisontale lyn sny g slegs een keer*	**OR/OF** ✓ yes ✓ valid reason (2)

4.4.1	$y = -\log_2 x$ $2 = -\log_2 a$ $a = 2^{-2} = \dfrac{1}{4}$ or $a = \left(\dfrac{1}{2}\right)^2 = \dfrac{1}{4}$	✓ correct subst into correct formula $(a\ ;\ 2)$ ✓answer (2)
4.4.2	$M'\left(2; \dfrac{1}{4}\right)$ or $M'(2; a)$	✓ answer (1)
4.5	$M''\left(-1; \dfrac{9}{4}\right)$	✓ -1 ✓✓ $\dfrac{9}{4}$ (3)
		[11]