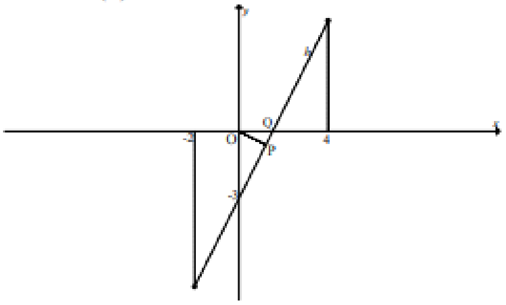
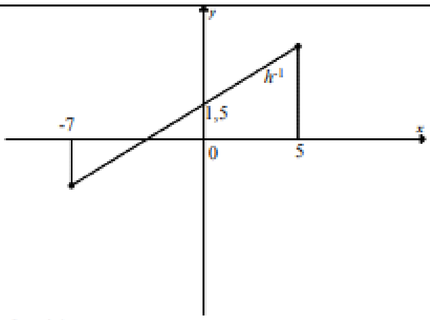
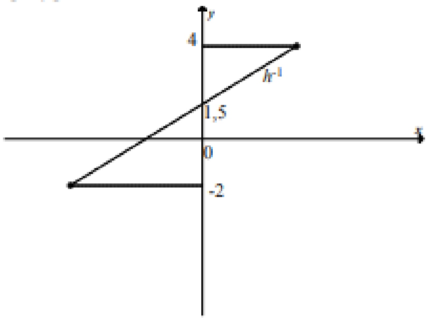
<u>**FUNCTION AND INVERSES MEMO**</u>

QUESTION/*VRAAG* 5

Given $h(x)=2x-3$ for $-2\leq x\leq 4$. 		
5.1	For x-intercepts, $y=0$ $2x-3=0$ $x=1{,}5$ $Q(1{,}5\ ;\ 0)$	✓ $x=1{,}5$ ✓ $y=0$ (2)
5.2	h: $x=-2$: $y=2(-2)-3=-7$ $x=4$: $y=2(4)-3=5$ Domain of $h^{-1}: -7\leq x\leq 5$ **OR/*OF*** $[-7;\ 5]$	✓ $h(-2)=-7$ ✓ $h(4)=5$ ✓ $-7\leq x\leq 5$ (3)
5.3	 **OR/*OF*** 	✓ y-intercept on a straight line ✓ line segment ✓ accurate endpoints (x or y or both) (3)

5.4	$h(x)=2x-3$ For the inverse of *h*, $x=2y-3$ $y=\frac{x+3}{2}$ $h^{-1}(x)=\frac{x+3}{2}$ $h(x)=h^{-1}(x)$ $2x-3=\frac{x+3}{2}$ $4x-6=x+3$ $x=3$	✓ $y=\frac{x+3}{2}$ ✓ $2x-3=\frac{x+3}{2}$ ✓ $x=3$ (3)
	OR/*OF* $h(x)=2x-3$ *h* and h^{-1} intersect when $y=x$ $h(x)=x$ $2x-3=x$ $x=3$	✓ $h(x)=x$ ✓ $2x-3=x$ ✓ $x=3$ (3)
	OR/*OF* $h(x)=2x-3$ For the inverse of *h*, $x=2y-3$ $y=\frac{x+3}{2}$ $h^{-1}(x)=x$ $\frac{x+3}{2}=x$ $x+3=2x$ $x=3$	✓ $y=\frac{x+3}{2}$ ✓ $\frac{x+3}{2}=x$ ✓ $x=3$ (3)

5.5	$OP^2 = (x-0)^2 + (y-0)^2$	✓ $OP^2 = x^2 + y^2$
	$= x^2 + (2x-3)^2$	✓substitute $y = 2x - 3$
	$= x^2 + 4x^2 - 12x + 9$	
	$= 5x^2 - 12x + 9$	✓ $5x^2 - 12x + 9$
	For OP to be at its minimum, OP^2 has to be a minimum *Vir OP om minimum te wees, moet OP^2 'n minimum wees*	
	$\frac{d(OP^2)}{dx} = 0$ **OR** / *OF* $x = -\frac{b}{2a}$	
	$10x - 12 = 0$ $= -\frac{-12}{2(5)}$	
	$\therefore x = \frac{6}{5}$	✓x-value
	Minimum length of OP $= \sqrt{5\left(\frac{6}{5}\right)^2 - 12\left(\frac{6}{5}\right) + 9} = \sqrt{\frac{9}{5}}$ or $\frac{3}{\sqrt{5}}$ or 1,34 units	✓answer (5)
	OR/*OF*	
	For minimum distance OP ⊥ the line	
	$m_h = 2$ (given)	
	$m_{OP} = \frac{-1}{2}$	
	$\therefore$ OP has equation $y = \frac{-1}{2}x$	
	$\frac{-1}{2}x = 2x - 3$	
	$-x = 4x - 6$	
	$5x = 6$	✓ $m_{OP} = \frac{-1}{2}$
	$x_P = 1,2$	✓equation of OP
	$y_P = -\frac{1}{2}(1,2) = -0,6$	
	$OP = \sqrt{(1,2-0)^2 + (-0,6-0)^2}$	✓ $\frac{-1}{2}x = 2x - 3$
	$= 1,34$ or $\sqrt{1,8}$ units	
		✓x-value
		✓answer (5)

WCED SEPTEMBER 2016

QUESTION/ *VRAAG* 6 (8)

#	SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD*	DESCRIPTORS/*BESKRYWERS*	Mark/ Punt
6.1.1	$y > -1; y \in R$	✓✓$y > 0; y \in R$	(2)
6.1.2	$g(x) = 2^x$ $\therefore g^{-1}: y = \log_2 x$	✓ $g(x) = 2^x$ ✓$y = \log_2 x$	(2)
6.2.1	$k(x) = 3x^2$; $x \leq 0$	✓ $k(x) = 3x^2$ ✓ $x \leq 0$	(2)
6.2.2	(0; 0) OR/*OF* origin/ *oorsprong*	✓✓ Answer/ *Antw*	(2)
			[8]

NOVEMBER 2021

QUESTION/VRAAG 6

6.1	$f(x)=\log_4 x$ $2=\log_4 k$ $4^2=k$ $\therefore k=16$	✓ substitution of $(k\,;2)$ ✓ answer	(2)
6.2	$-1=\log_4 x \quad \therefore \ x=\frac{1}{4}$ $\frac{1}{4}\leq x\leq 16$ or/of $x\in\left[\frac{1}{4}\,;16\right]$	✓ $x=\frac{1}{4}$ ✓ answer	(2)
6.3	$f(x)=\log_4 x$ $y=\log_4 x$ $x=\log_4 y$ $y=4^x$	✓swopping x and y ✓answer	(2)
6.4	$x<0$ **OR/*OF*** $x\in(-\infty\,;0)$	✓✓answer (2) **OR/*OF*** ✓✓answer	(2)
			[8]

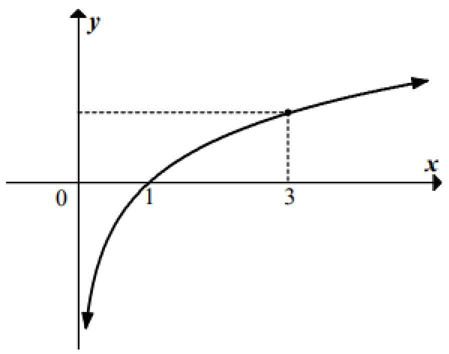
NSC JUNE 2021

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]

FEB/MARCH 2018

QUESTION/*VRAAG* 5

5.1	$a^0=1$ T(0 ; 1)	✓ $x=0$ ✓ $y=1$ (2)
5.2	$g(x)=a^x$ $9=a^2$ $a=3$ $a>0$	✓ substitution ✓ $a=3$ (2)
5.3	$y=\left(\frac{1}{3}\right)^x$ or $y=3^{-x}$	✓✓ $y=\left(\frac{1}{3}\right)^x$ (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]**

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 $(-6\,;-12)$ $-12=a(-6)^2$ $a=\frac{-1}{3}$	✓substitution ✓answer (2)
4.4	$f: y=-\left(\frac{1}{3}\right)x^2$ $f^{-1}: x=-\left(\frac{1}{3}\right)y^2$ $y^2=-3x$ $y=\pm\sqrt{-3x}$ Only $y=-\sqrt{-3x}$ and $x\le 0$	✓swapping x and y ✓ $y^2=-3x$ ✓ $y=-\sqrt{-3x}$ (3)
		[8]

JUNE 2018

QUESTION/*VRAAG* 4

4.1	$0<x\le 1$ or $(0\,;1]$	✓✓ answer (2)
4.2	$p=\log_{\frac{4}{3}}\frac{16}{9}$ $\left(\frac{4}{3}\right)^p=\frac{16}{9}$ $\left(\frac{4}{3}\right)^p=\left(\frac{4}{3}\right)^2$ $p=2$	✓ substitution ✓$\left(\frac{4}{3}\right)^2$ ✓ answer (3)
4.3	$f: y=\log_{\frac{4}{3}}x$ $f^{-1}: x=\log_{\frac{4}{3}}y$ $y=\left(\frac{4}{3}\right)^x$	✓ $x=\log_{\frac{4}{3}}y$ ✓ $y=\left(\frac{4}{3}\right)^x$ (2)
4.4	$y>0$ or $y\in(0;\infty)$	✓✓ answer (2)
4.5	$\left(-2\,;\frac{16}{9}\right)$	✓ –2 ✓ $\frac{16}{9}$ (2) **[11]**