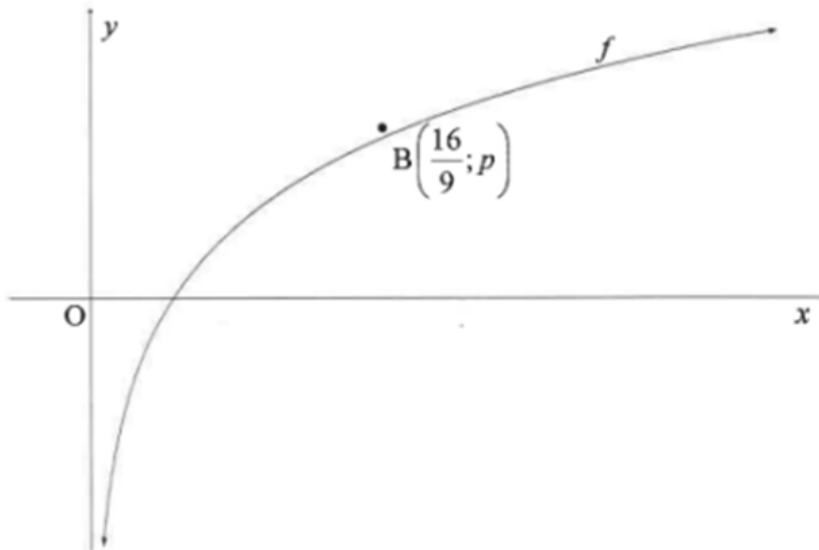


**JUNE 2018**

**QUESTION 4**

The graph of  $f(x) = \log_{\frac{4}{3}} x$  is drawn below.  $B\left(\frac{16}{9}; p\right)$  is a point on  $f$ .



- 4.1 For which value(s) of  $x$  is  $\log_{\frac{4}{3}} x \leq 0$ ? (2)
- 4.2 Determine the value of  $p$ , without the use of a calculator. (3)
- 4.3 Write down the equation of the inverse of  $f$  in the form  $y = \dots$  (2)
- 4.4 Write down the range of  $y = f^{-1}(x)$ . (2)
- 4.5 The function  $h(x) = \left(\frac{3}{4}\right)^x$  is obtained after applying two reflections on  $f$ .  
Write down the coordinates of  $B''$ , the image of  $B$  on  $h$ . (2)

**[11]**

**JUNE 2018**

**QUESTION/VRAAG 4**

4.1	$0 < x \leq 1$ or $(0 ; 1]$	✓✓ answer (2)
4.2	$p = \log_4 \frac{16}{3}$ $\left(\frac{4}{3}\right)^p = \frac{16}{9}$ $\left(\frac{4}{3}\right)^p = \left(\frac{4}{3}\right)^2$ $p = 2$	✓ 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]

**WCED SEPTEMBER 2016**

**QUESTION 6**

6.1 Given:  $f(x) = 2 \cdot 2^x - 1$

6.1.1 Write down the range of  $f$ . (2)

6.1.2  $g(x) = f(x - 1) + 1$ . Write down the equation of  $g^{-1}$ , the inverse of  $g$  in the form  $y = \dots$  (2)

**WCED SEPTEMBER 2016**

QUESTION/ VRAAG 6 (8)

#	SUGGESTED ANSWER/ VOORGESTELDE ANTWOORD	DESCRIPTORS/BESKRYWERS	Mark/ Punt
6.1.1	$y > -1; y \in \mathbb{R}$	✓✓ $y > 0; y \in \mathbb{R}$	(2)
6.1.2	$g(x) = 2^x$ $\therefore g^{-1}: y = \log_2 x$	✓ $g(x) = 2^x$ ✓ $y = \log_2 x$	(2)

**NSC JUNE 2021**

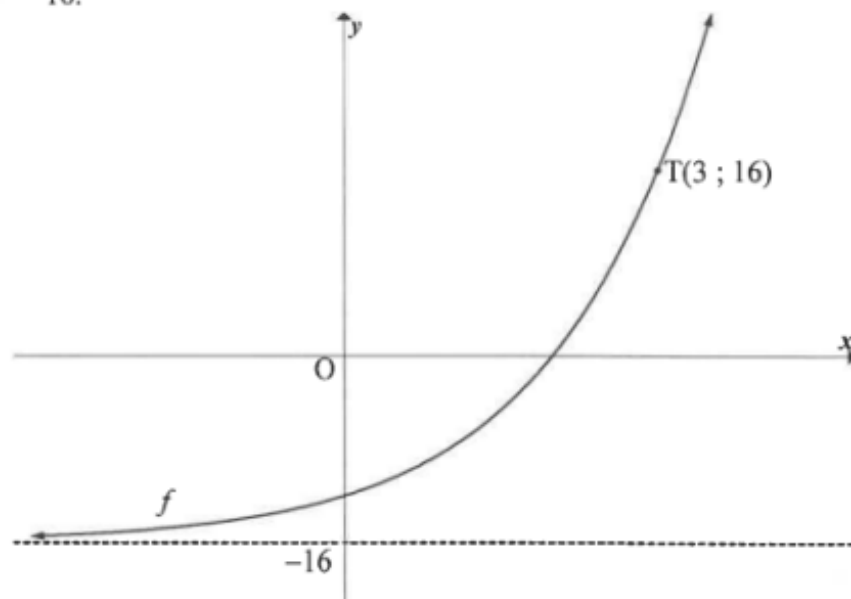
**QUESTION 6**

6.1 Given:  $g(x) = 3^x$

6.1.1 Write down the equation of  $g^{-1}$  in the form  $y = \dots$  (2)

6.1.2 Point P(6 ; 11) lies on  $h(x) = 3^{x-4} + 2$ . The graph of  $h$  is translated to form  $g$ . Write down the coordinates of the image of P on  $g$ . (2)

6.2 Sketched is the graph of  $f(x) = 2^{x+p} + q$ . T(3 ; 16) is a point on  $f$  and the asymptote of  $f$  is  $y = -16$ .



Determine the values of  $p$  and  $q$ .

(4)  
[8]

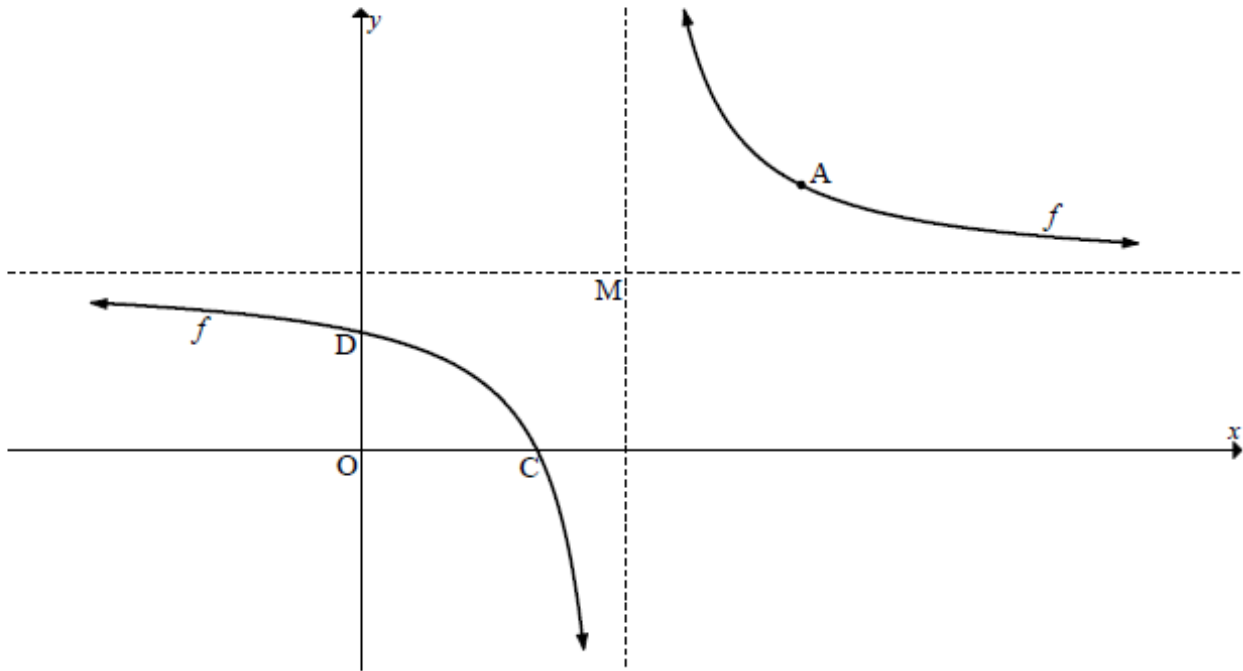
**NSC JUNE 2021**

**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)
		<b>[8]</b>

**QUESTION 4**

The graph of  $f(x) = \frac{4}{x-3} + 4$  is drawn below.  $M$  is the point where the asymptotes of  $f$  intersect.  $C$  and  $D$  are the  $x$ - and  $y$ -intercepts respectively of  $f$ .  $A$  is the point on  $f$  that is closest to  $M$ .



- 4.1 Write down the coordinates of  $M$ . (2)
- 4.2 Calculate the coordinates of  $D$ . (2)
- 4.3 If  $y = x + t$  is the equation of a line of symmetry of  $f$ , calculate the value of  $t$ . (2)
- 4.4 Determine the values of  $x$  for which  $f(x) \leq 0$ . (4)
- 4.5 Calculate the coordinates of  $A$ . (3)
- 4.6 A single transformation is applied to  $f$  to obtain a new graph defined as  $h(x) = \frac{-4}{x+3} + 4$ .  $A'$  is the image of  $A$  under this transformation. Calculate the length of  $AA'$ . (2)

[15]

**QUESTION/VRAAG 4**

4.1	M(3 ; 4)	$\checkmark x = 3$ $\checkmark y = 4$	(2)	
4.2	$f(x) = \frac{4}{x-3} + 4$ $y = \frac{4}{0-3} + 4 = \frac{8}{3}$ $\therefore D\left(0; \frac{8}{3}\right)$	$\checkmark x = 0$ $\checkmark y\text{-value}$	(2)	
4.3	M(3 ; 4) $y = x + t$ $4 = 3 + t$ $t = 1$	<b>OR/OF</b> $y = (x + p) + q$ $y = x - 3 + 4$ $y = x + 1$ $\therefore t = 1$	$\checkmark$ substituting M $\checkmark$ value of t	(2)
4.4	$\frac{4}{x-3} + 4 = 0$ $-4(x-3) = 4$ $x-3 = -1$ $x = 2$ C(2 ; 0) $\therefore 2 \leq x < 3$	$\checkmark y = 0$ $\checkmark x = 2$ $\checkmark\checkmark$ answer	(4)	
4.5	$\frac{4}{x-3} + 4 = x + 1$ $\frac{4}{x-3} = x - 3$ $4 = (x-3)^2$ $\pm 2 = x - 3$ $\therefore x = 5$ or $x = 1$ $\therefore A(5 ; 6)$	<div style="border: 1px solid black; padding: 5px; text-align: center;"> DEPARTMENT OF BASIC  EDUCATION  PRIVATE BAG X895, PRETORIA 0001    <b>25 -05- 2025</b>    APPROVED MARKING GUIDELINE  PUBLIC EXAMINATION </div>	$\checkmark$ equating $\checkmark x_A \checkmark y_A$	(3)
	<b>OR/OF</b> Point closest to the origin in $y = \frac{a}{x}$ is $(\sqrt{a}; \sqrt{a})$ By translation: A( $\sqrt{a} + 3; \sqrt{a} + 4$ ) A(5 ; 6)	<b>OR/OF</b> $\checkmark$ translation $\checkmark x_A \checkmark y_A$	(3)	
4.6	$h(x) = \frac{-4}{x+3} + 4$ $= \frac{4}{-x-3} + 4$ $\therefore$ Reflection in y - axis. A'(-5;6) AA' = 10	$\checkmark$ coordinates $\checkmark$ distance	(2)	

15

**QUESTION 6**

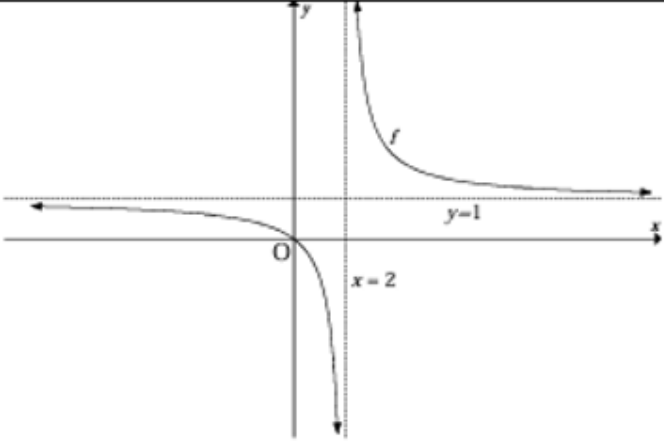
The function  $f$ , defined by  $f(x) = \frac{a}{x+p} + q$ , has the following properties:

- The range of  $f$  is  $y \in R, y \neq 1$ .
- The graph  $f$  passes through the origin.
- $P(\sqrt{2} + 2; \sqrt{2} + 1)$  lies on the graph  $f$ .

- 6.1 Write down the value of  $q$ . (1)
- 6.2 Calculate the values of  $a$  and  $p$ . (5)
- 6.3 Sketch a neat graph of this function. Your graph must include the asymptotes, if any. (4)
- [10]**

JUNE 2018

QUESTION/VRAAG 6

6.1	$q = 1$	$\checkmark q = 1$ (1)
6.2	<p>Subs (0;0) <math>0 = \frac{a}{0+p} + 1</math></p> $\frac{a}{p} = -1$ $a = -p$ <p>Subs P:</p> $\sqrt{2} + 1 = \frac{a}{\sqrt{2} + 2 + p} + 1$ $\sqrt{2} = \frac{a}{\sqrt{2} + 2 + p}$ $2 + 2\sqrt{2} + \sqrt{2}p = a$ $2 + 2\sqrt{2} = a - p\sqrt{2} = a + a\sqrt{2}$ $2(1 + \sqrt{2}) = a(1 + \sqrt{2})$ $a = 2; p = -2$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">                     NOTE:                      Answer only 2 / 5                 </div>	$\checkmark 0 = \frac{a}{0+p} + 1$  $\checkmark a = -p$  $\checkmark$ substitution   $\checkmark a = 2$ $\checkmark p = -2$ (5)
6.3		$\checkmark y = 1$ $\checkmark x = 2$ $\checkmark$ shape $\checkmark (0; 0)$ (4) <b>[10]</b>