NATIONAL (May/June)

QUESTION 4

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

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]

QUESTION 5

5.1 Given: $f(x)=\frac{1}{x+2}+3$

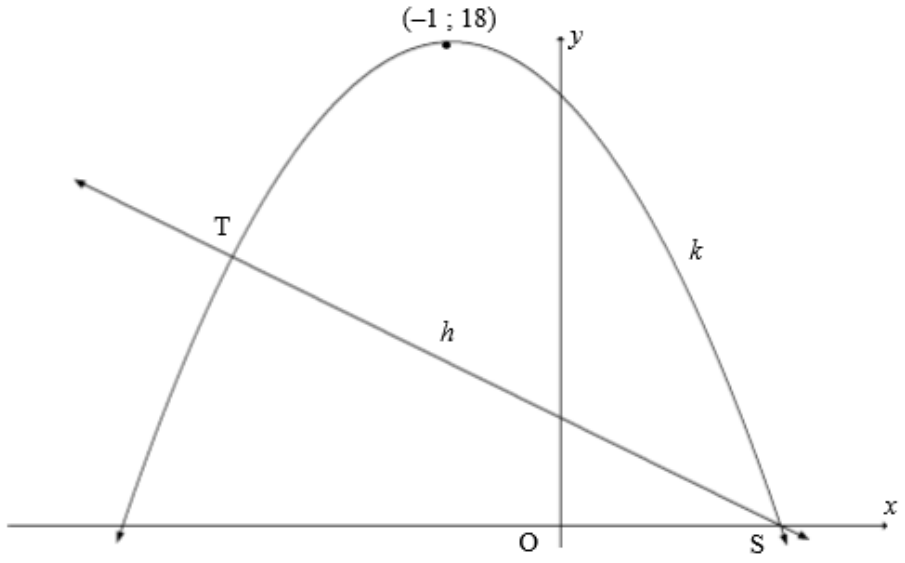
5.1.1 Determine the equations of the asymptotes of f. (2)

5.1.2 Write down the y-intercept of f. (1)

5.1.3 Calculate the x-intercept of f. (2)

5.1.4 Sketch the graph of f. Clearly label ALL intercepts with the axes and any asymptotes. (3)

5.2 Sketched below are the graphs of $k(x)=ax^2+bx+c$ and $h(x)=-2x+4$. Graph k has a turning point at (–1 ; 18). S is the x-intercept of h and k. Graphs h and k also intersect at T.



5.2.1 Calculate the coordinates of S. (2)

5.2.2 Determine the equation of k in the form $y=a(x+p)^2+q$ (3)

5.2.3 If $k(x)=-2x^2-4x+16$, determine the coordinates of T. (5)

5.2.4 Determine the value(s) of x for which $k(x)<h(x)$. (2)

5.2.5 It is further given that k is the graph of $g'(x)$.

(a) For which values of x will the graph of g be concave up? (2)

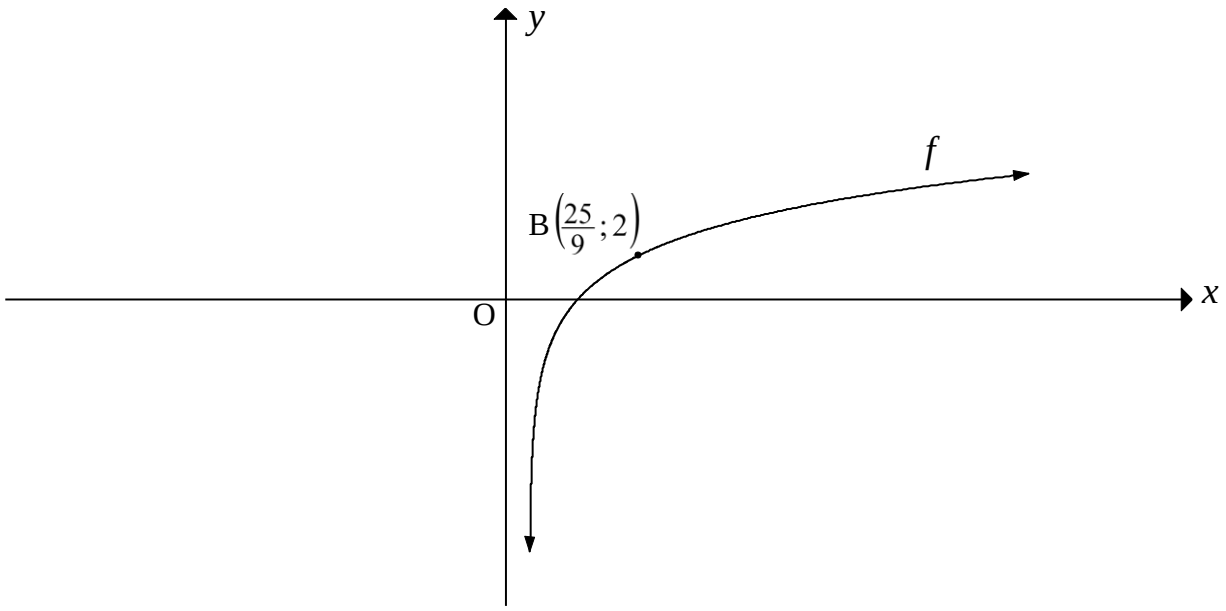
(b) Sketch the graph of g, showing clearly the x-values of the turning points and the point of inflection. (3)

[25]

FREE STATE

QUESTION 4

In the diagram, the graph of $f(x) = \log_a x$ is drawn. B$\left(\frac{25}{9};2\right)$ is a point on *f*.



4.1 Determine the value of ***a***. (2)

4.2 Determine the value(s) of *x* for which $f(x) \leq 0$. (2)

4.3 Write down the equation of f^{-1}, the inverse of f, in the form $y = \ldots$ (2)

4.4 B$^{//}$ is the reflection of B on the graph $g(x) = \left(\frac{3}{5}\right)^x$.

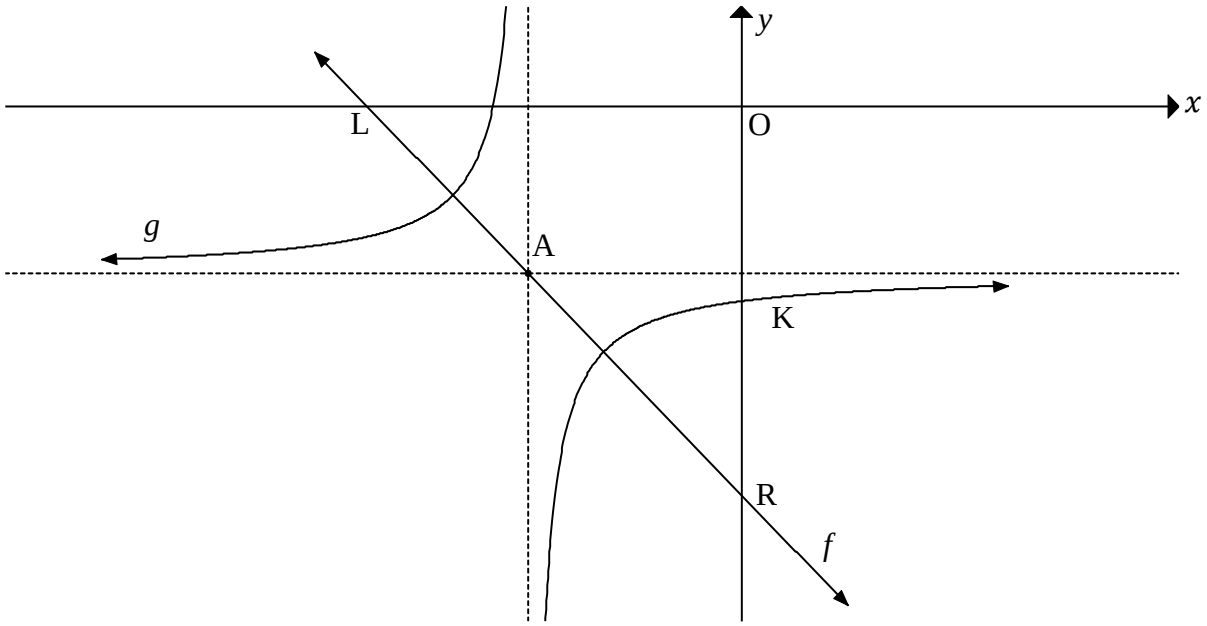
Write down the coordinates of B$^{//}$. (2)

4.5 Determine for which value(s) of *x* will $f^{-1}(x) > \frac{25}{9}$. (2)

[10]

QUESTION 5

In the diagram below, the graph of $g(x) = \frac{-2}{x+4} - 3$ is drawn. The graph f passes through A, the point of intersection of the asymptotes of *g*, and cuts the *x*-axis and the *y*-axis at L and R respectively. K is the *y*-intercept of *g*.



5.1 Determine the equation of f in the form $y = mx + c$. (3)

5.2 Write down the equation of the asymptotes of $g(x-2) + 1$. (2)

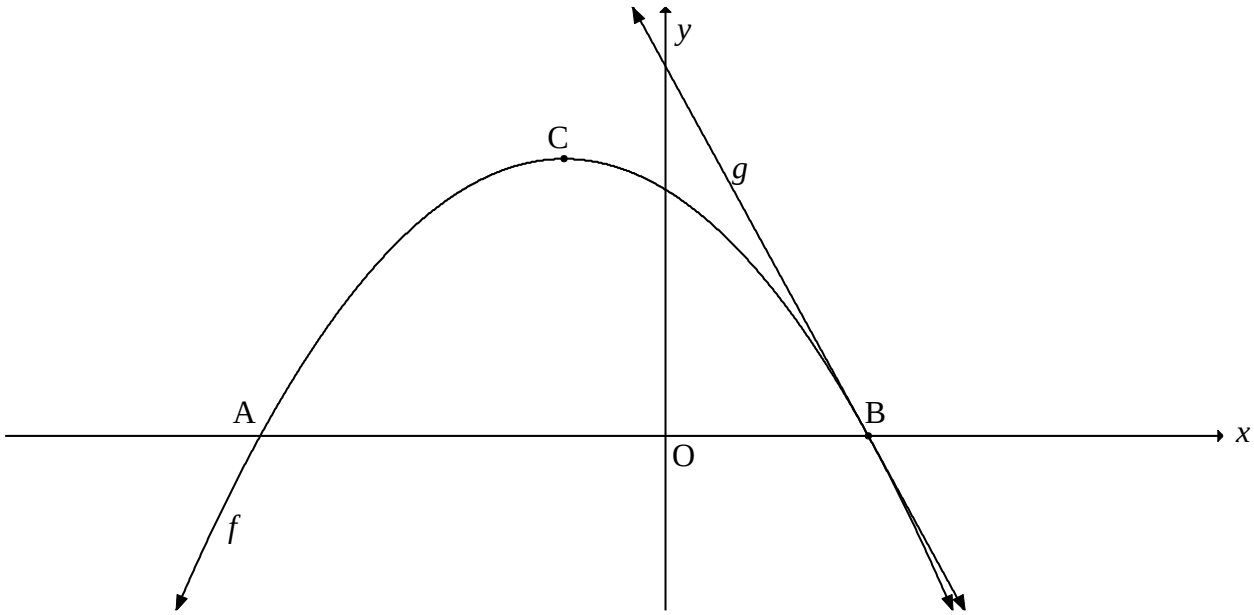
5.3 Calculate the length of KR. (3)

5.4 The graph of *h*, where *h* is the reflection of f in the line $y = -7$, passes through the point S(– 4 ; *p*). Calculate the area of ΔARS. (4)

[12]

QUESTION 6

In the diagram below, the graphs of $f(x) = ax^2 + bx + 16$ and $g(x) = -12x + 24$ are drawn. The graph of g is a tangent to the graph of f at B. A and B are the x-intercepts of f and C, the turning point.



6.1 Calculate the coordinates of B. (2)

6.2 Determine the values of a and b. (6)

6.3 If it is given that $f(x) = -2x^2 - 4x + 16$, determine:

6.3.1 The range of f (5)

6.3.2 The value(s) of x for which $f'(x)$. g(x) > 0 (2)

[15]

EASTERN CAPE

QUESTION 4

Given: $f(x)=1+\frac{2}{x+3}$

4.1 Write down the equations of the asymptotes of f. (2)

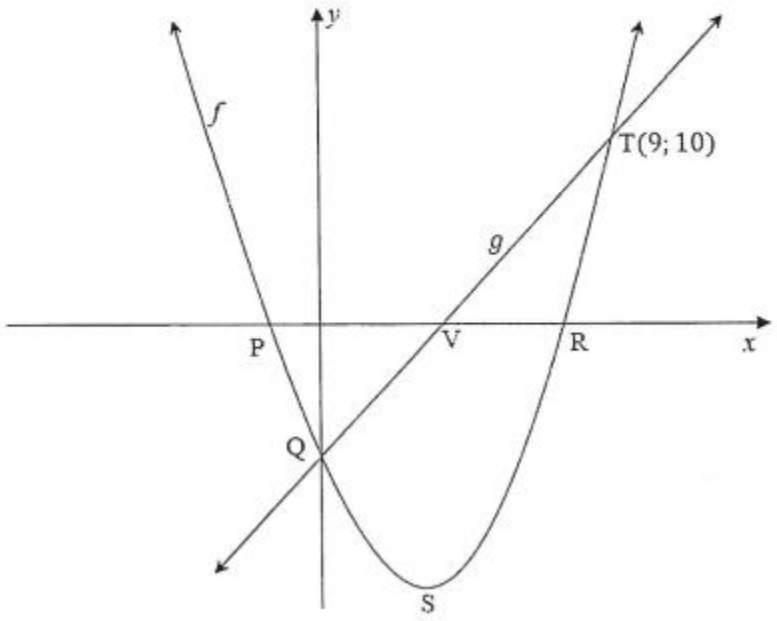
4.2 Calculate the x and y intercepts of f. (3)

4.3 Draw a neat sketch of f, clearly indicating all intercepts with the axes and any asymptotes. (4)

4.4 Given that h is a reflection of f in the x-axis, determine the equation of the axis of symmetry of h having a positive gradient. (4)
[13]

QUESTION 5

The diagram below shows the graphs of $f(x)=x^2-7x-8$ and $g(x)=mx+c$.
P and R are x-intercepts of f, and V is the x-intercept of g. S is the turning point of f.
f and g intersect on the y-axis at Q and also at T(9; 10).



5.1 Write down the coordinates of Q. (1)

5.2 Determine the equation of g. (3)

5.3 Write down the equation of f in the form $y = a(x + p)^2 + q$. (2)

5.4 Hence, or otherwise, determine the coordinates of S, the turning point of f. (2)

5.5 Determine the coordinates of a point W, on f, such that the average gradient between T and W is 1. (5)

5.6 Determine the values of x for which $f(x).g(x) < 0$. (4)
[17]

QUESTION 6

Given: $f(x) = \log_m x$

6.1 Determine the value of m, if the point $(64;3)$ lies on f. (2)

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

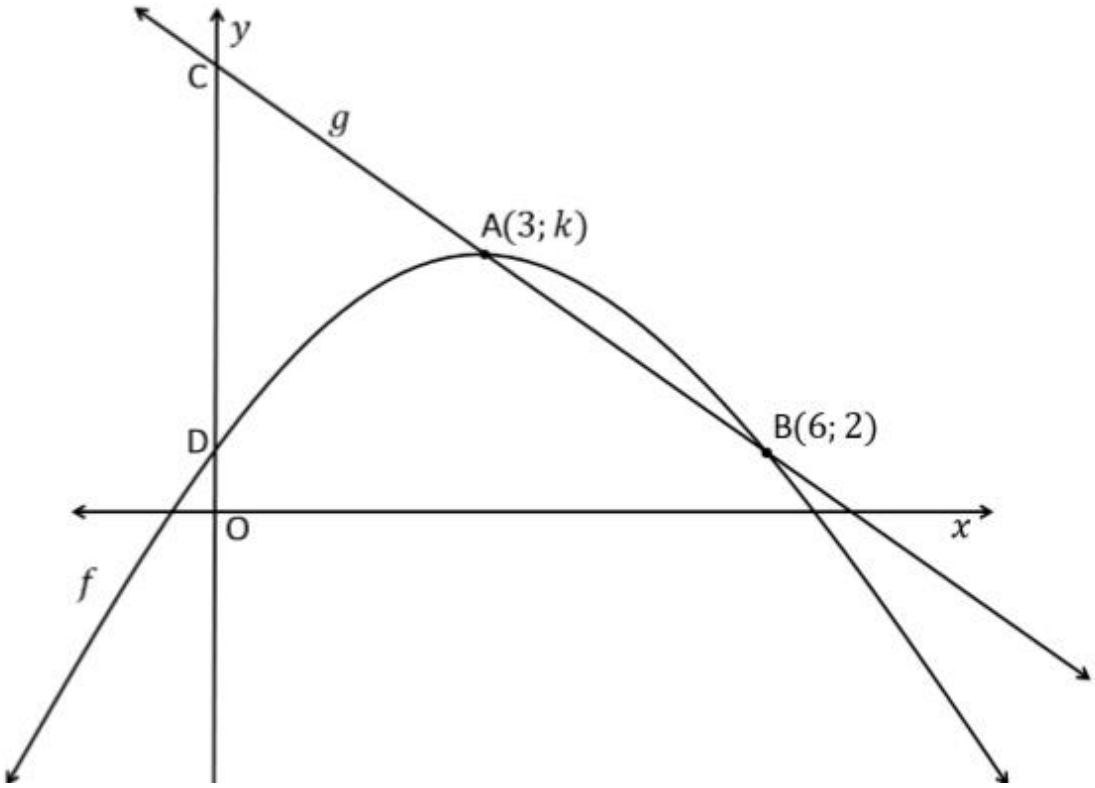
6.3 Draw a neat sketch of f^{-1}, showing all intercepts with the axes. Indicate at least one other point on your graph. (2)

6.4 Write down the range of h if: $h(x) = f^{-1}(x) - 2$ (1)
[7]

WESTERN CAPE (Practice paper)

QUESTION 5

Sketched below are the graphs of $g(x) = -3x + 20$ and $f(x) = ax^2 + bx + c$.
Graph f has a turning point at $A(3; k)$. Graph f and g intersects at A and $B(6; 2)$.



5.1 Calculate the numerical value of k, the y-coordinate of A. (2)

5.2 Determine the range of $y = -f(x)$. (2)

5.3 Calculate the numerical values of a, b and c. (6)

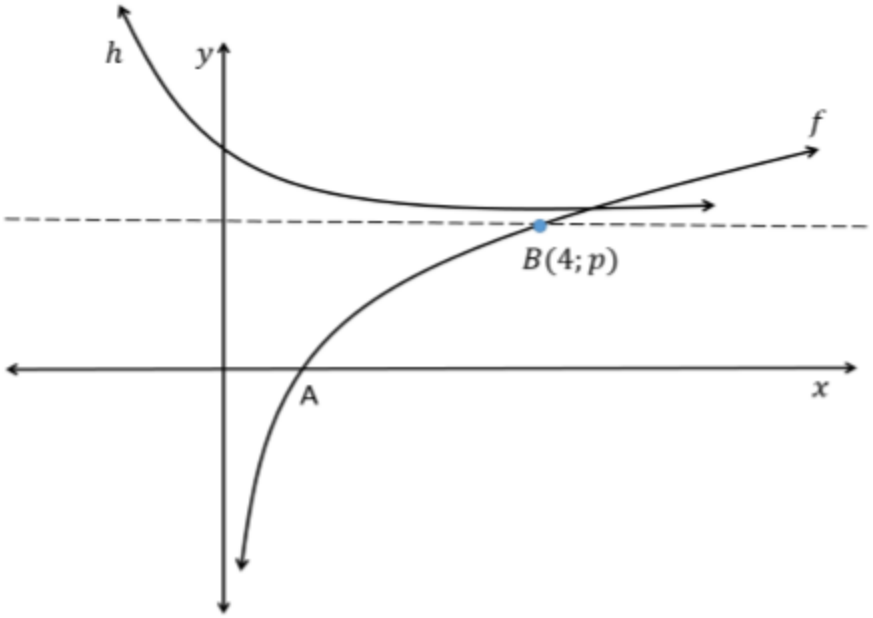
5.4 Determine the value(s) of x for which $f(x) > g(x)$. (2)

5.5 Describe the nature of the roots for $f(x) - 11$. (2)

5.6 Determine the value(s) of x for which $f'(x) \cdot g'(x) > 0$. (2)
[16]

QUESTION 6

Sketched below are the graphs of $h(x) = \left(\frac{1}{2}\right)^x + q$ and $f(x) = \log_2 x$.
Graph f and the asymptote of h intersect at $B(4; p)$.



6.1 Write down the coordinates of A, the x −intercept of f. (1)

6.2 Determine the domain of f. (1)

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

6.4 Sketch the graph of f^{-1}. Clearly labelling the intercept(s) with the axes as well as the coordinates of any one other point on the graph. (3)

6.5 Determine the equation of the asymptote of h. (2)

6.6 Describe, in words, the transformation of h to f^{-1}. (2)
[11]

LIMPOPO

QUESTION 4

4.1 The sum to $n-$terms of a sequence of numbers is given as : $S_n = \frac{n}{2}(5n+9)$.

4.1.1 Calculate the sum to 23 terms of the sequence. (3)

4.1.2 Hence calculate the 23^{nd} term of the sequence. (2)

4.2 If x is a real number, show that the following sequence can NOT be geometric:

$1\ ;\ x+1;\ x-3;\ \ldots\ldots$ (4)

[9]

QUESTION 5

5.1 Consider the function: $f(x) = \frac{-6}{x-3} - 1$.

5.1.1 Calculate the $y-$intercept of f. (2)

5.1.2 Calculate the $x-$intercept of f. (3)

5.1.3 Sketch the graph of f, showing the asymptotes and the intercepts with the axes. Use the ANSWER SHEET given. (4)

5.1.4 For which values of x is $f(x) > 0$? (2)

5.1.5 Calculate the average gradient of f between $x = -2$ and $x = 0$. (4)

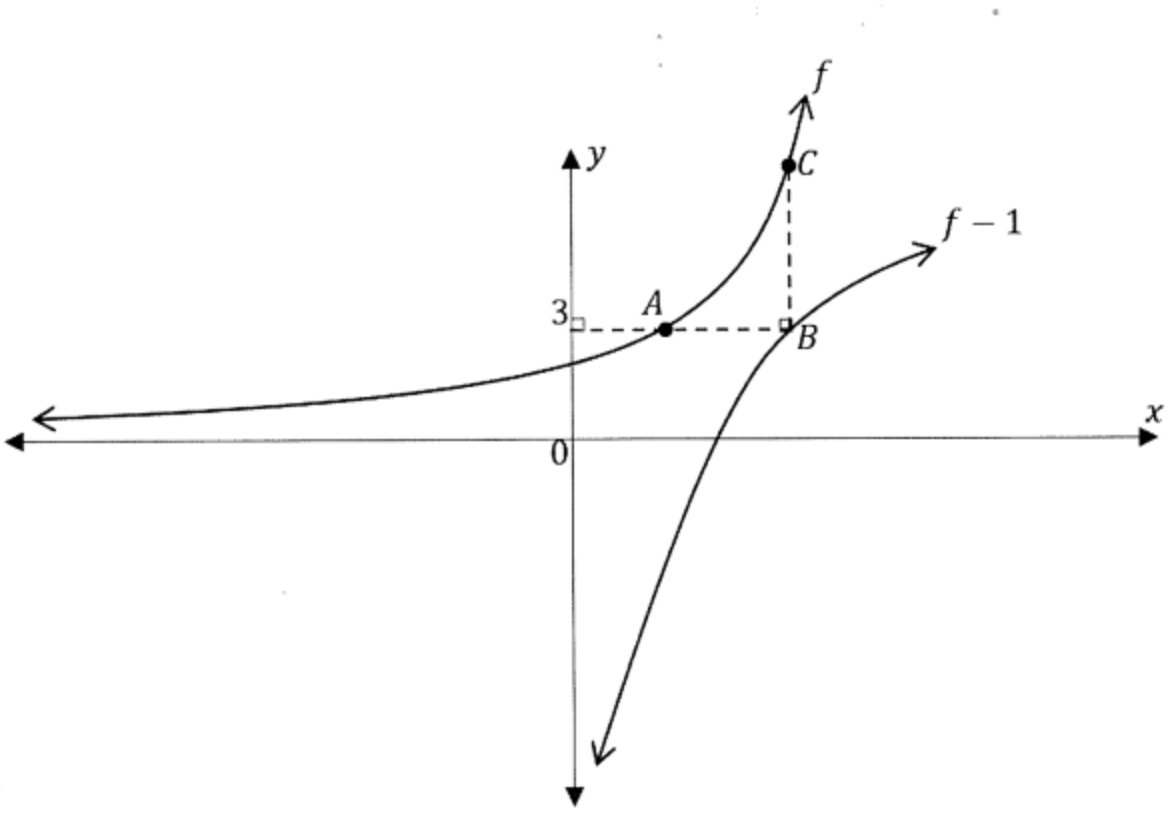
5.2 Draw a sketch graph of $y = ax^2 + bx + c$, $a < 0$, $b < 0$, $c < 0$ and $ax^2 + bx + c = 0$ has only ONE solution. (4)

[19]

QUESTION 6

In the diagram below $f(x) = 2^x$ and f^{-1} are given. A and C are points on f.

B is a point on f^{-1}. CB and AB are perpendicular to each other.



6.1 Write down the equation of $f^{-1}(x)$ in the form $y = ...$ (2)

6.2 Calculate the length of AB. (5)

6.3 Calculate the length of CB, where CB $\perp$ AB. (3)

6.4 Write down the domain of $f^{-1}(x)$. (1)

[11]