

WTS TUTORING



WTS 12 FUNCTIONS

PAST PAPERS

GRADE	: 12
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WHERE TO START MATHS & SCIENCE IS FOR THE NATION

KWV 01

QUESTION 4

4.1 Given: $h(x) = \frac{-3}{x-1} + 2$

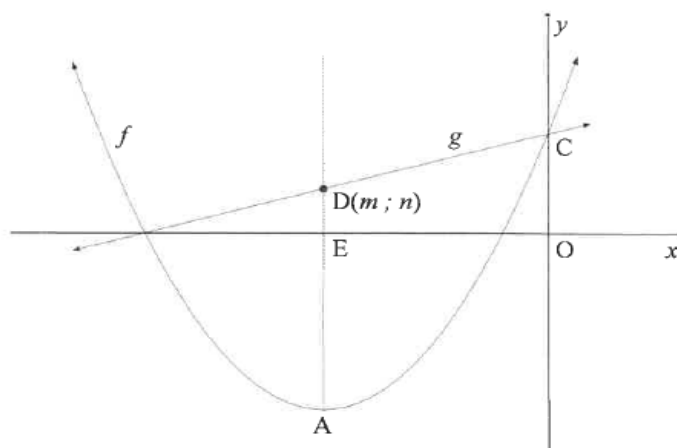
4.1.1 Write down the equations of the asymptotes of h . (2)

4.1.2 Determine the equation of the axis of symmetry of h that has a negative gradient. (2)

4.1.3 Sketch the graph of h , showing the asymptotes and the intercepts with the axes. (4)

4.2 The graphs of $f(x) = \frac{1}{2}(x+5)^2 - 8$ and $g(x) = \frac{1}{2}x + \frac{9}{2}$ are sketched below.

- A is the turning point of f .
- The axis of symmetry of f intersects the x -axis at E and the line g at $D(m; n)$.
- C is the y -intercept of f and g .



4.2.1 Write down the coordinates of A. (2)

4.2.2 Write down the range of f . (1)

4.2.3 Calculate the values of m and n . (3)

4.2.4 Calculate the area of OCDE. (3)

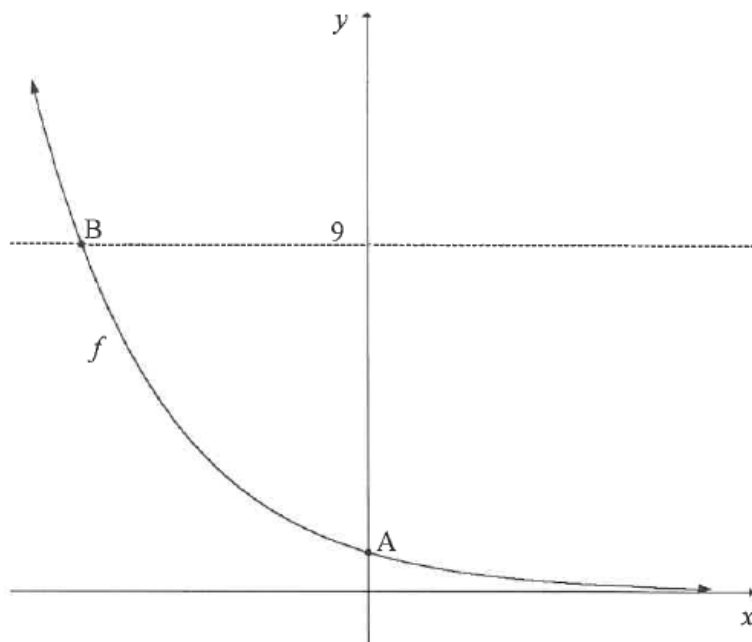
4.2.5 Determine the equation of g^{-1} , the inverse of g , in the form $y = \dots$ (2)

4.2.6 If $h(x) = g^{-1}(x) + k$ is a tangent to f , determine the coordinates of the point of contact between h and f . (4)

[23]

QUESTION 5

The graph of $f(x) = 3^{-x}$ is sketched below. A is the y -intercept of f .
B is the point of intersection of f and the line $y = 9$.



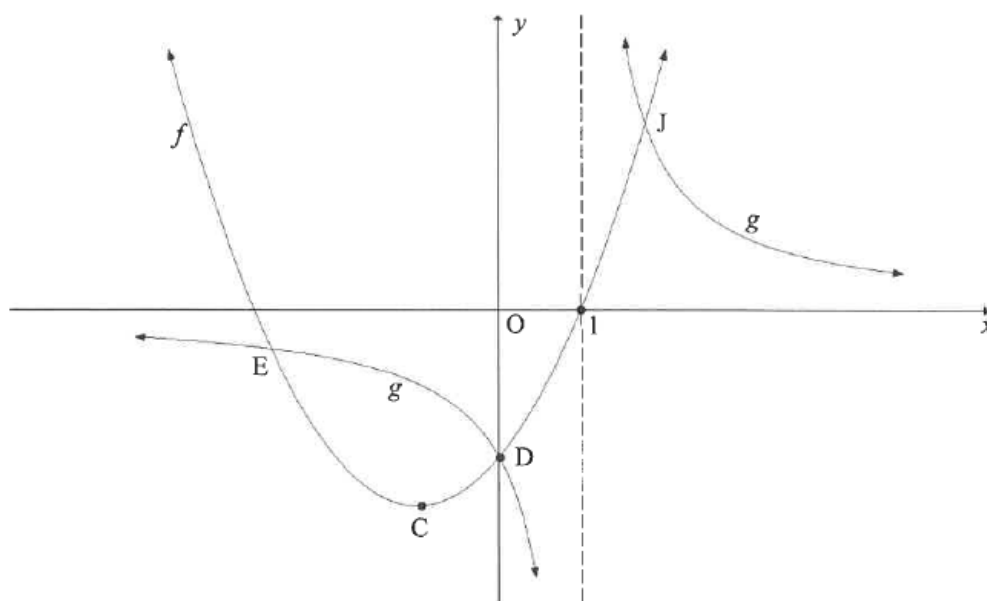
- 5.1 Write down the coordinates of A. (1)
- 5.2 Determine the coordinates of B. (3)
- 5.3 Write down the domain of f^{-1} . (2)
- 5.4 Describe the translation from f to $h(x) = \frac{27}{3^x}$. (3)
- 5.5 Determine the values of x for which $h(x) < 1$. (3)
- [12]

KWV 02

QUESTION 4

Below are the graphs of $f(x) = x^2 + bx - 3$ and $g(x) = \frac{a}{x+p}$.

- f has a turning point at C and passes through the x -axis at $(1; 0)$.
- D is the y -intercept of both f and g . The graphs f and g also intersect each other at E and J .
- The vertical asymptote of g passes through the x -intercept of f .

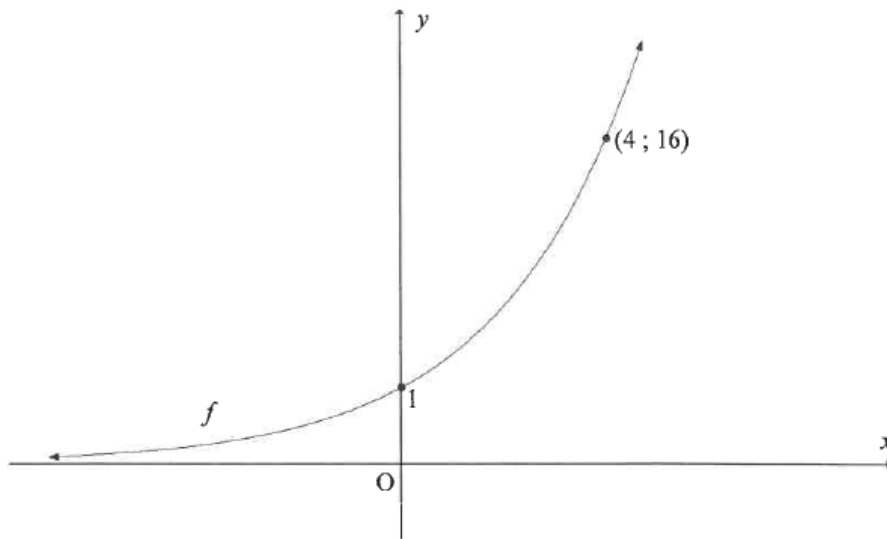


- 4.1 Write down the value of p . (1)
- 4.2 Show that $a = 3$ and $b = 2$. (3)
- 4.3 Calculate the coordinates of C . (4)
- 4.4 Write down the range of f . (2)
- 4.5 Determine the equation of the line through C that makes an angle of 45° with the positive x -axis. Write your answer in the form $y = \dots$ (3)
- 4.6 Is the straight line, determined in QUESTION 4.5, a tangent to f ? Explain your answer. (2)
- 4.7 The function $h(x) = f(m - x) + q$ has only one x -intercept at $x = 0$. Determine the values of m and q . (4)

[19]

QUESTION 5

Sketched below is the graph of $f(x) = k^x$; $k > 0$. The point $(4 ; 16)$ lies on f .



- 5.1 Determine the value of k . (2)
- 5.2 Graph g is obtained by reflecting graph f about the line $y = x$. Determine the equation of g in the form $y = \dots$ (2)
- 5.3 Sketch the graph g . Indicate on your graph the coordinates of two points on g . (4)
- 5.4 Use your graph to determine the value(s) of x for which:
- 5.4.1 $f(x) \times g(x) > 0$ (2)
- 5.4.2 $g(x) \leq -1$ (2)
- 5.5 If $h(x) = f(-x)$, calculate the value of x for which $f(x) - h(x) = \frac{15}{4}$ (4)

[16]

KWV 03

QUESTION 5

Given: $f(x) = \frac{-1}{x-1}$

- 5.1 Write down the domain of f . (1)
- 5.2 Write down the asymptotes of f . (2)
- 5.3 Sketch the graph of f , clearly showing all intercepts with the axes and any asymptotes. (3)
- 5.4 For which values of x will $x \cdot f'(x) \geq 0$? (2)
- [8]**

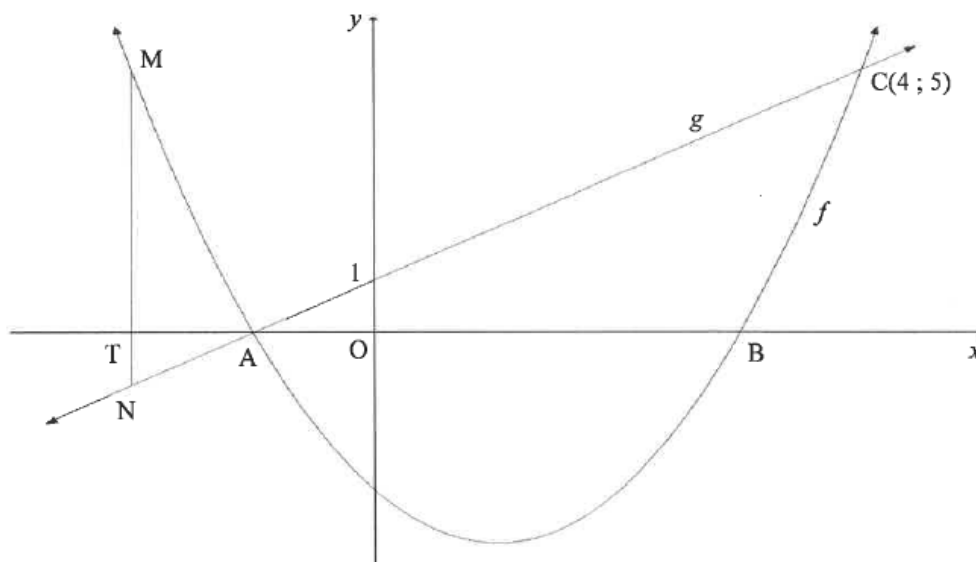
QUESTION 6

In the diagram below, A and B are the x -intercepts of the graph of $f(x) = x^2 - 2x - 3$.

A straight line, g , through A cuts f at $C(4; 5)$ and the y -axis at $(0; 1)$.

M is a point on f and N is a point on g such that MN is parallel to the y -axis.

MN cuts the x -axis at T.



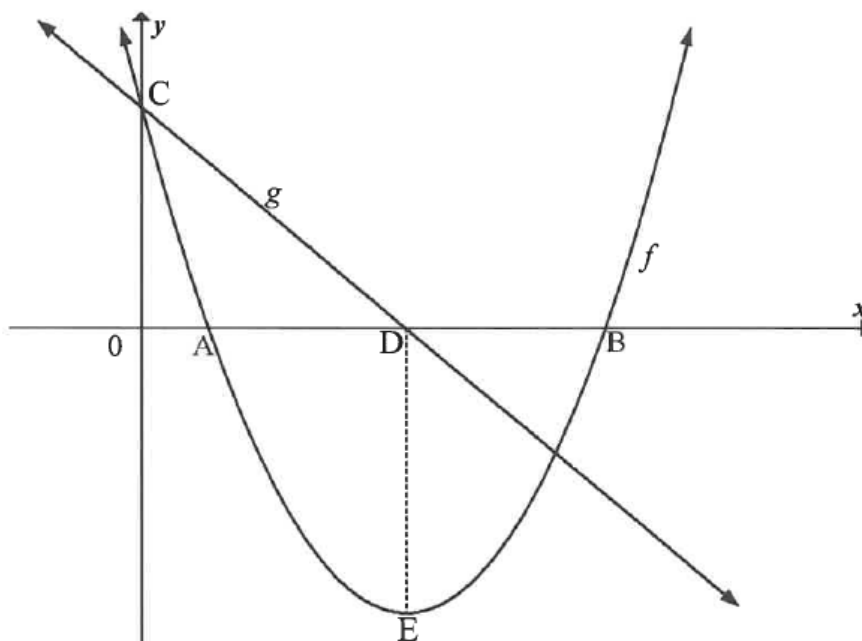
- 6.1 Show that $g(x) = x + 1$. (2)
- 6.2 Calculate the coordinates of A and B. (3)
- 6.3 Determine the range of f . (3)
- 6.4 If $MN = 6$:
- 6.4.1 Determine the length of OT if T lies on the negative x -axis. Show ALL your working. (4)
- 6.4.2 Hence, write down the coordinates of N. (2)
- 6.5 Determine the equation of the tangent to f drawn parallel to g . (5)
- 6.6 For which value(s) of k will $f(x) = x^2 - 2x - 3$ and $h(x) = x + k$ NOT intersect? (1)
- [20]**

KWV 04

QUESTION 4

Below are the graphs of $f(x) = (x - 4)^2 - 9$ and a straight line g .

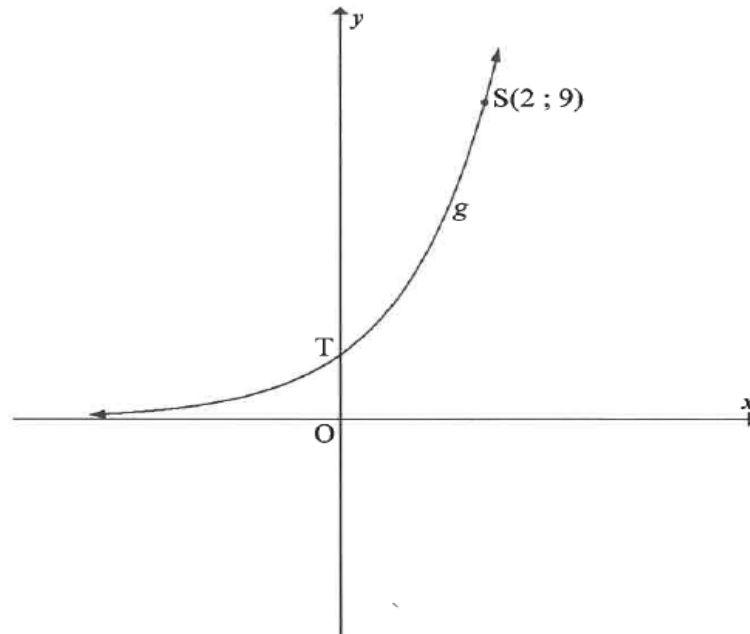
- A and B are the x -intercepts of f and E is the turning point of f .
- C is the y -intercept of both f and g .
- The x -intercept of g is D. DE is parallel to the y -axis.



- 4.1 Write down the coordinates of E. (2)
- 4.2 Calculate the coordinates of A. (3)
- 4.3 M is the reflection of C in the axis of symmetry of f . Write down the coordinates of M. (3)
- 4.4 Determine the equation of g in the form $y = mx + c$. (3)
- 4.5 Write down the equation of g^{-1} in the form $y = \dots$ (3)
- 4.6 For which values of x will $x(f(x)) \leq 0$? (4)
- [18]**

QUESTION 5

The graph of $g(x) = a^x$ is drawn in the sketch below. The point $S(2 ; 9)$ lies on g . T is the y -intercept of g .



- 5.1 Write down the coordinates of T . (2)
- 5.2 Calculate the value of a . (2)
- 5.3 The graph h is obtained by reflecting g in the y -axis. Write down the equation of h . (2)
- 5.4 Write down the values of x for which $0 < \log_3 x < 1$. (2)
- [8]**

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]**

KWV 05

QUESTION 4

Given: $f(x) = -ax^2 + bx + 6$

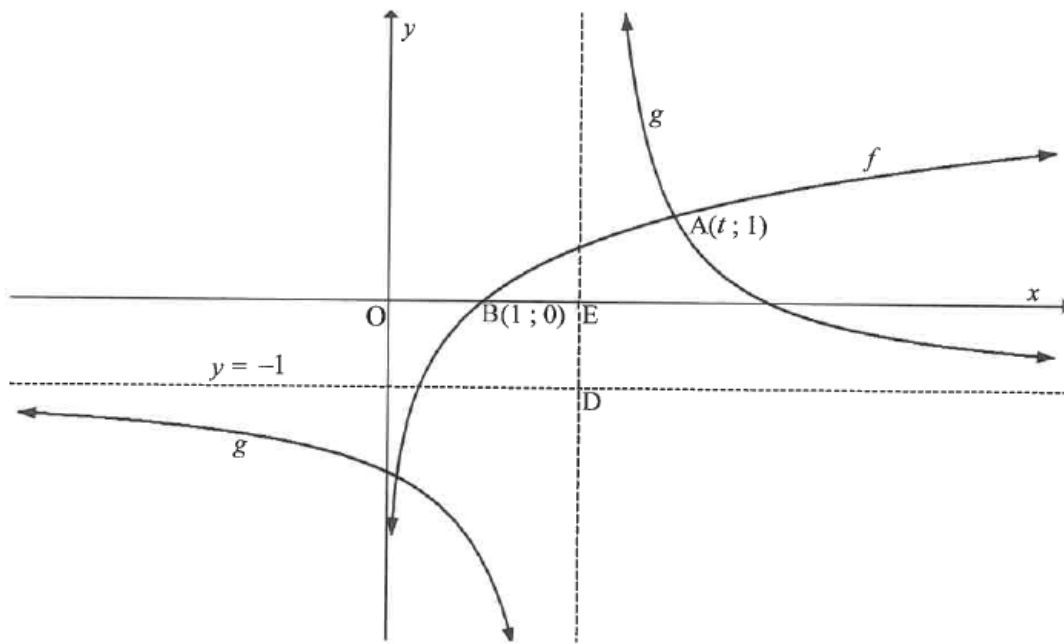
- 4.1 The gradient of the tangent to the graph of f at the point $\left(-1; \frac{7}{2}\right)$ is 3.
Show that $a = \frac{1}{2}$ and $b = 2$. (5)
- 4.2 Calculate the x -intercepts of f . (3)
- 4.3 Calculate the coordinates of the turning point of f . (3)
- 4.4 Sketch the graph of f . Clearly indicate ALL intercepts with the axes and the turning point. (4)
- 4.5 Use the graph to determine the values of x for which $f(x) > 6$. (3)
- 4.6 Sketch the graph of $g(x) = -x - 1$ on the same set of axes as f . Clearly indicate ALL intercepts with the axes. (2)
- 4.7 Write down the values of x for which $f(x) \cdot g(x) \leq 0$. (3)

[23]

QUESTION 5

The diagram below shows the graphs of $g(x) = \frac{2}{x+p} + q$ and $f(x) = \log_3 x$.

- $y = -1$ is the horizontal asymptote of g .
- $B(1; 0)$ is the x -intercept of f .
- $A(t; 1)$ is a point of intersection between f and g .
- The vertical asymptote of g intersects the x -axis at E and the horizontal asymptote at D .
- $OB = BE$.



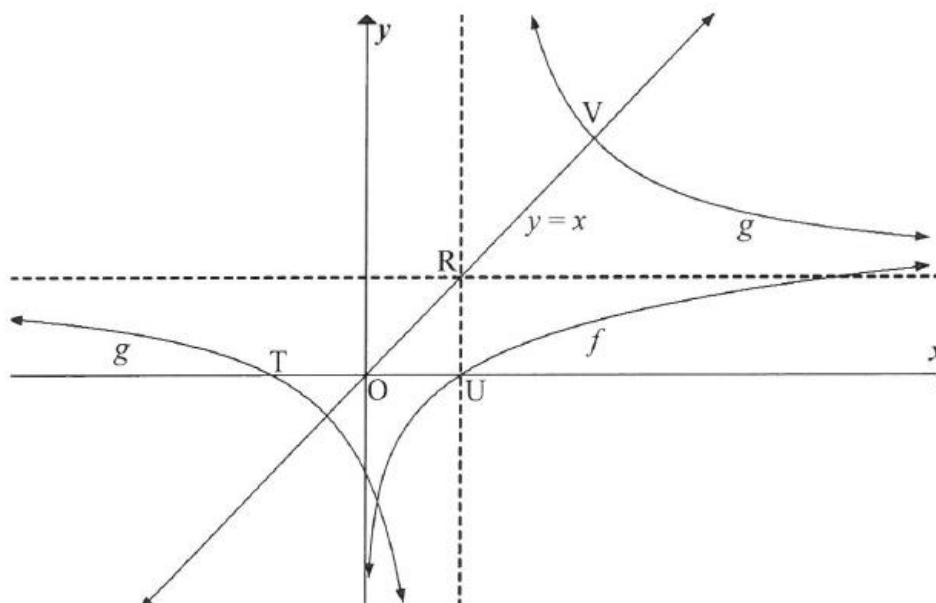
- 5.1 Write down the range of g . (2)
- 5.2 Determine the equation of g . (2)
- 5.3 Calculate the value of t . (3)
- 5.4 Write down the equation of f^{-1} , the inverse of f , in the form $y = \dots$ (2)
- 5.5 For which values of x will $f^{-1}(x) < 3$? (2)
- 5.6 Determine the point of intersection of the graphs of f and the axis of symmetry of g that has a negative gradient. (3)
- [14]**

KWV 06

QUESTION 4

The sketch below shows the graphs of $f(x) = \log_5 x$ and $g(x) = \frac{2}{x-1} + 1$.

- T and U are the x -intercepts of g and f respectively.
- The line $y = x$ intersects the asymptotes of g at R, and the graph of g at V.



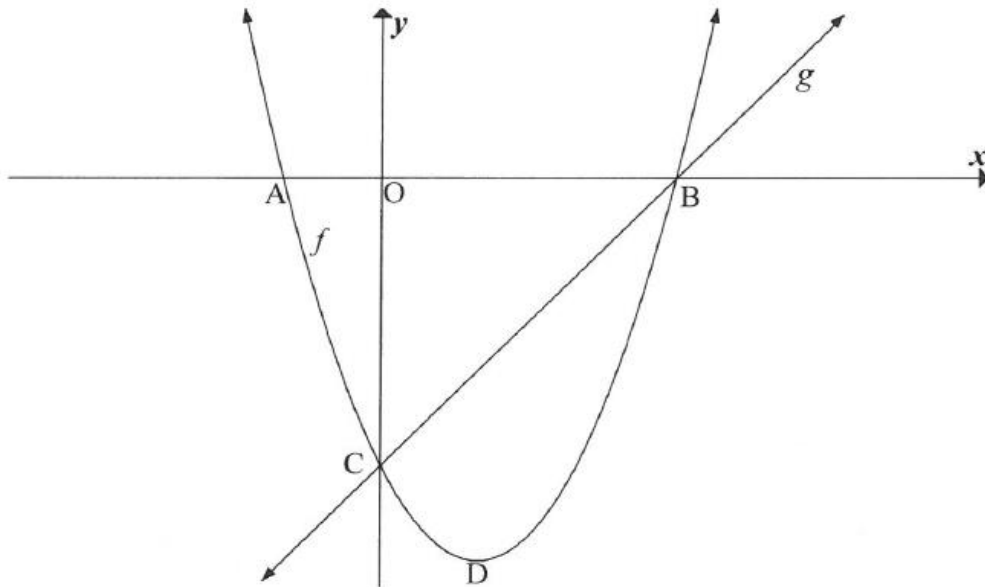
- 4.1 Write down the coordinates of U. (1)
 - 4.2 Write down the equations of the asymptotes of g . (2)
 - 4.3 Determine the coordinates of T. (2)
 - 4.4 Write down the equation of h , the reflection of f in the line $y = x$, in the form $y = \dots$ (2)
 - 4.5 Write down the equation of the asymptote of $h(x-3)$. (1)
 - 4.6 Calculate the coordinates of V. (4)
 - 4.7 Determine the coordinates of T' the point which is symmetrical to T about the point R. (2)
- [14]**

QUESTION 5

5.1 The sketch below shows the graphs of $f(x) = x^2 - 2x - 3$ and $g(x) = x - 3$.

- A and B are the x -intercepts of f .
- The graphs of f and g intersect at C and B.

D is the turning point of f .



- 5.1.1 Determine the coordinates of C. (1)
- 5.1.2 Calculate the length of AB. (4)
- 5.1.3 Determine the coordinates of D. (2)
- 5.1.4 Calculate the average gradient of f between C and D. (2)
- 5.1.5 Calculate the size of $\hat{O}CB$ (2)
- 5.1.6 Determine the values of k for which $f(x) = k$ will have two unequal positive real roots. (3)
- 5.1.7 For which values of x will $f'(x) \cdot f''(x) > 0$? (3)

5.2 The graph of a parabola f has x -intercepts at $x = 1$ and $x = 5$. $g(x) = 4$ is a tangent to f at P, the turning point of f . Sketch the graph of f , clearly showing the intercepts with the axes and the coordinates of the turning point. (5)

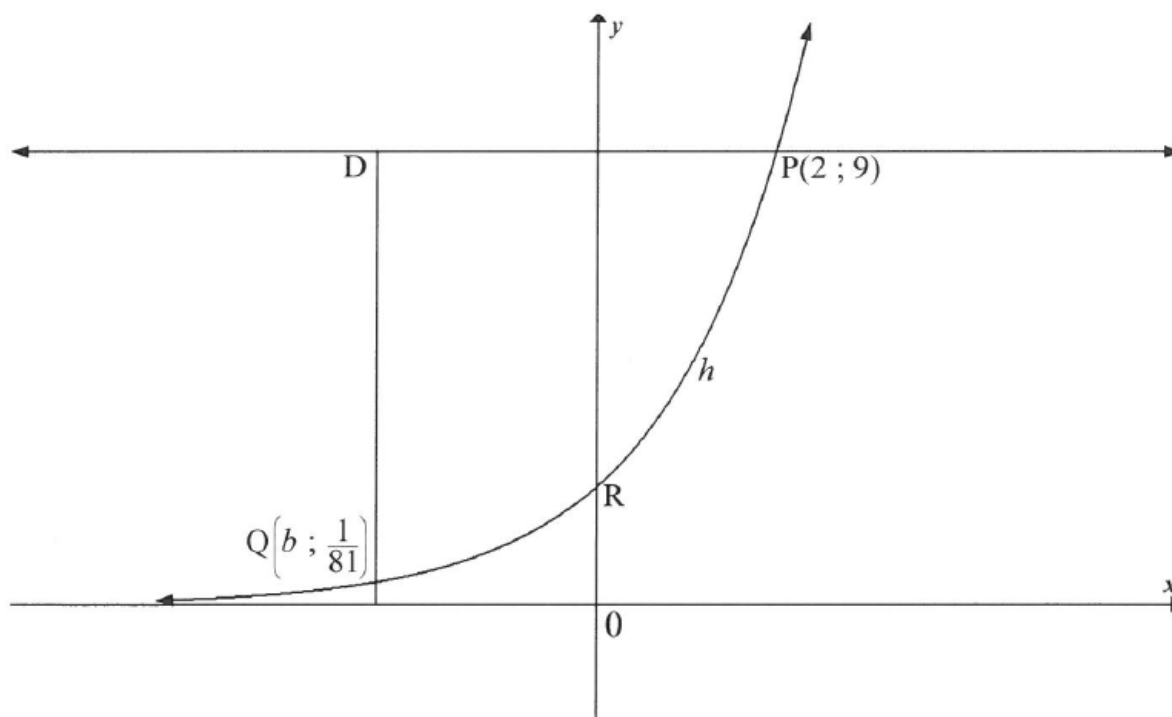
[22]

KWV 07

QUESTION 4

Sketched below is the graph of $h(x) = a^x$, $a > 0$. R is the y -intercept of h .

The points $P(2; 9)$ and $Q\left(b; \frac{1}{81}\right)$ lie on h .

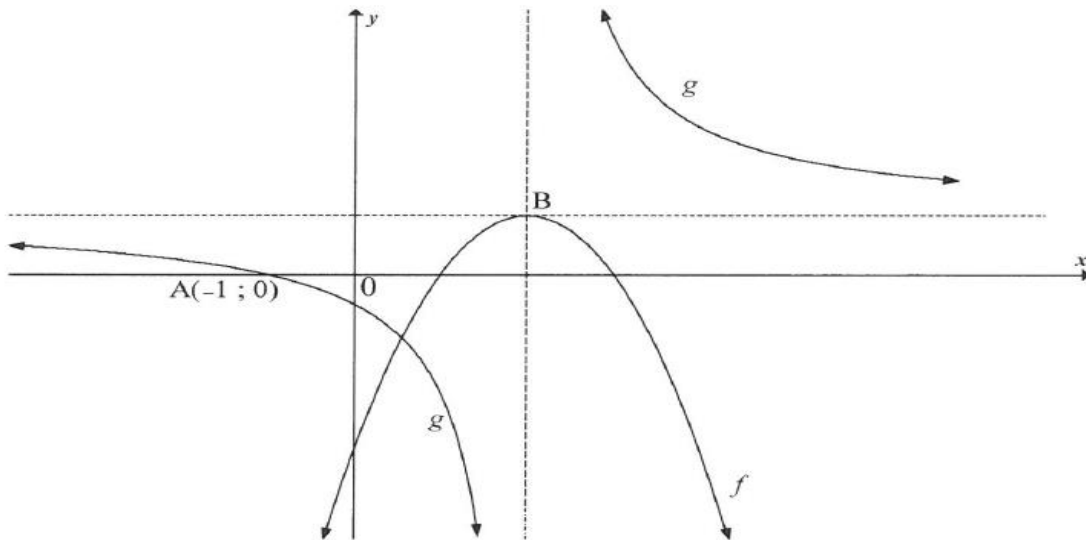


- 4.1 Write down the equation of the asymptote of h . (1)
- 4.2 Determine the coordinates of R. (1)
- 4.3 Calculate the value of a . (2)
- 4.4 D is a point such that $DQ \parallel y$ -axis and $DP \parallel x$ -axis. Calculate the length of DP. (4)
- 4.5 Determine the values of k for which the equation $h(x+2) + k = 0$ will have a root that is less than -6 . (3)
- [11]

QUESTION 5

Sketched below is the parabola f , with equation $f(x) = -x^2 + 4x - 3$ and a hyperbola g , with equation $(x - p)(y + t) = 3$.

- B, the turning point of f , lies at the point of intersection of the asymptotes of g .
- A(-1 ; 0) is the x -intercept of g .



- 5.1 Show that the coordinates of B are (2 ; 1) (2)
- 5.2 Write down the range of f . (1)
- 5.3 For which value(s) of x will $g(x) \geq 0$? (2)
- 5.4 Determine the equation of the vertical asymptote of the graph of h if $h(x) = g(x + 4)$ (1)
- 5.5 Determine the values of p and t . (4)
- 5.6 Write down the values of x for which $f(x) \cdot g'(x) \geq 0$ (4)
- [14]**

QUESTION 6

Given: $f(x) = -x + 3$ and $g(x) = \log_2 x$

- 6.1 On the same set of axes, sketch the graphs of f and g , clearly showing ALL intercepts with the axes. (4)
- 6.2 Write down the equation of $g^{-1}(x)$, the inverse of g , in the form $y = \dots$ (2)
- 6.3 Explain how you will use QUESTION 6.1 and/or QUESTION 6.2 to solve the equation $\log_2(3 - x) = x$. (3)
- 6.4 Write down the solution to $\log_2(3 - x) = x$. (1)
- [10]**

KWV 08

QUESTION 4

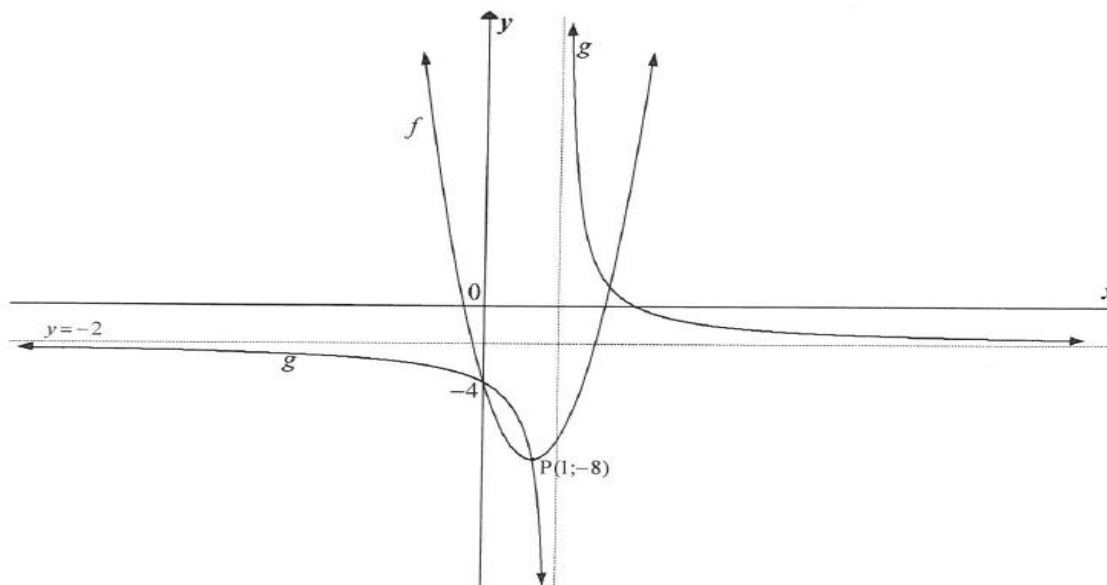
Given: $f(x) = 2^{-x} + 1$

- 4.1 Determine the coordinates of the y -intercept of f . (1)
- 4.2 Sketch the graph of f , clearly indicating ALL intercepts with the axes as well as any asymptotes. (3)
- 4.3 Calculate the average gradient of f between the points on the graph where $x = -2$ and $x = 1$. (3)
- 4.4 If $h(x) = 3f(x)$, write down an equation of the asymptote of h . (1)
- [8]**

QUESTION 5

The graphs of the functions $f(x) = a(x + p)^2 + q$ and $g(x) = \frac{k}{x+r} + d$ are sketched below.

Both graphs cut the y -axis at -4 . One of the points of intersection of the graphs is $P(1; -8)$, which is also the turning point of f . The horizontal asymptote of g is $y = -2$.



- 5.1 Calculate the values of a , p and q . (4)
- 5.2 Calculate the values of k , r and d . (6)
- 5.3 Determine the value(s) of x in the interval $x \leq 1$ for which $g(x) \geq f(x)$. (2)
- 5.4 Determine the value(s) of k for which $f(x) = k$ has two, unequal positive roots. (2)
- 5.5 Write down an equation for the axis of symmetry of g that has a negative gradient. (3)
- 5.6 The point P is reflected in the line determined in QUESTION 5.5 to give the point Q . Write down the coordinates of Q . (2)
- [19]**

QUESTION 6

Given: $f(x) = \frac{1}{4}x^2, x \leq 0$

- 6.1 Determine the equation of f^{-1} in the form $f^{-1}(x) = \dots$ (3)
- 6.2 On the same system of axes, sketch the graphs of f and f^{-1} . Indicate clearly the intercepts with the axes, as well as another point on the graph of each of f and f^{-1} . (3)
- 6.3 Is f^{-1} a function? Give a reason for your answer. (2)

[8]

KWV 09

QUESTION 4

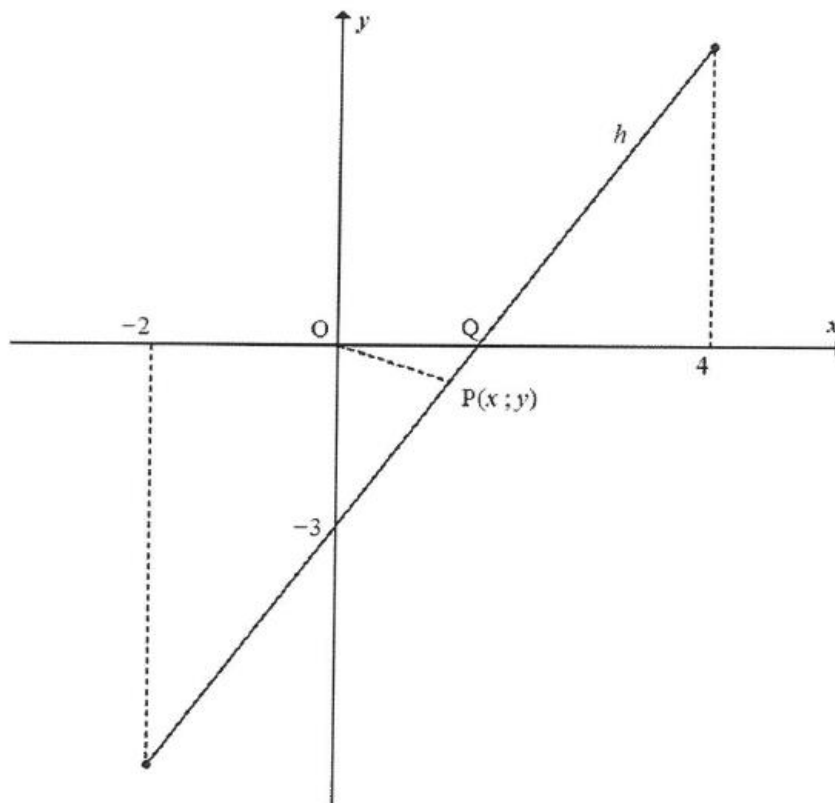
Given: $f(x) = 2^{x+1} - 8$

- 4.1 Write down the equation of the asymptote of f . (1)
- 4.2 Sketch the graph of f . Clearly indicate ALL intercepts with the axes as well as the asymptote. (4)
- 4.3 The graph of g is obtained by reflecting the graph of f in the y -axis. Write down the equation of g . (1)

[6]

QUESTION 5

Given: $h(x) = 2x - 3$ for $-2 \leq x \leq 4$. The x -intercept of h is Q .



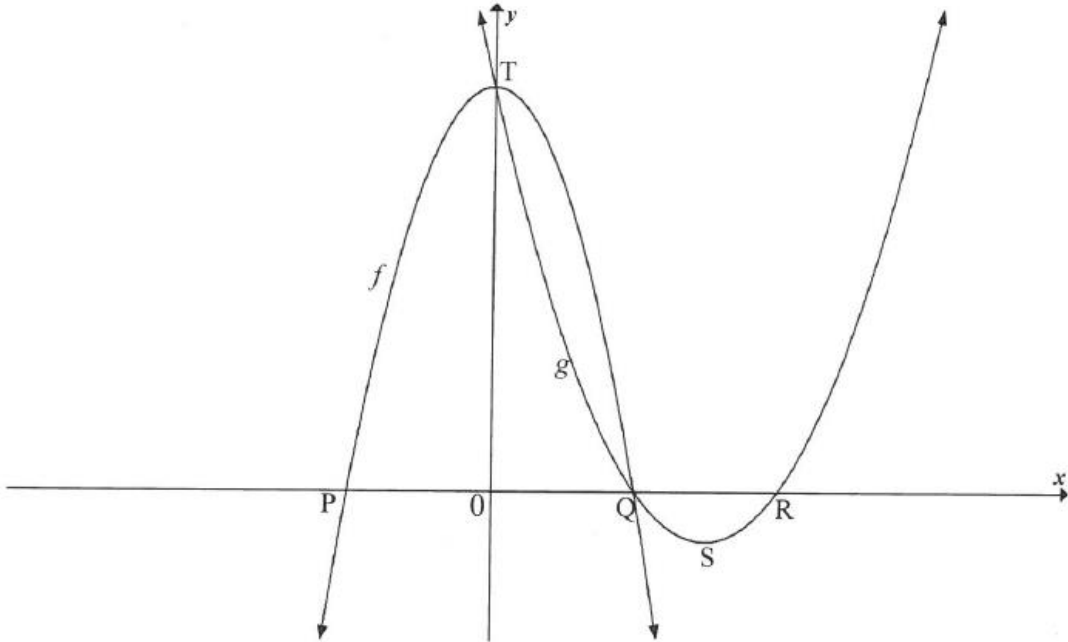
- 5.1 Determine the coordinates of Q . (2)
- 5.2 Write down the domain of h^{-1} . (3)
- 5.3 Sketch the graph of h^{-1} in your ANSWER BOOK, clearly indicating the y -intercept and the end points. (3)
- 5.4 For which value(s) of x will $h(x) = h^{-1}(x)$? (3)
- 5.5 $P(x; y)$ is the point on the graph of h that is closest to the origin. Calculate the distance OP . (5)
- 5.6 Given: $h(x) = f'(x)$ where f is a function defined for $-2 \leq x \leq 4$.
- 5.6.1 Explain why f has a local minimum. (2)
- 5.6.2 Write down the value of the maximum gradient of the tangent to the graph of f . (1)

[19]

QUESTION 6

6.1 The graphs of $f(x) = -2x^2 + 18$ and $g(x) = ax^2 + bx + c$ are sketched below.

Points P and Q are the x -intercepts of f . Points Q and R are the x -intercepts of g . S is the turning point of g . T is the y -intercept of both f and g .



- 6.1.1 Write down the coordinates of T. (1)
- 6.1.2 Determine the coordinates of Q. (3)
- 6.1.3 Given that $x = 4,5$ at S, determine the coordinates of R. (2)
- 6.1.4 Determine the value(s) of x for which $g''(x) > 0$. (2)

6.2 The function defined as $y = \frac{a}{x+p} + q$ has the following properties:

- The domain is $x \in R, x \neq -2$.
- $y = x + 6$ is an axis of symmetry.
- The function is increasing for all $x \in R, x \neq -2$.

Draw a neat sketch graph of this function. Your sketch must include the asymptotes, if any.

(4)
[12]

KWV 10

QUESTION 4

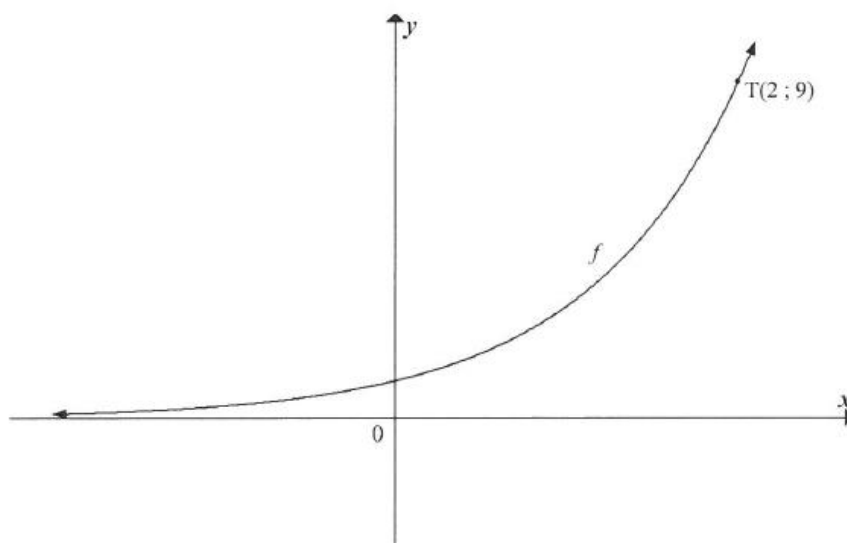
Given: $g(x) = \frac{6}{x+2} - 1$

- 4.1 Write down the equations of the asymptotes of g . (2)
- 4.2 Calculate:
- 4.2.1 The y -intercept of g (1)
- 4.2.2 The x -intercept of g (2)
- 4.3 Draw the graph of g , showing clearly the asymptotes and the intercepts with the axes. (3)
- 4.4 Determine the equation of the line of symmetry that has a negative gradient, in the form $y = \dots$ (3)
- 4.5 Determine the value(s) of x for which $\frac{6}{x+2} - 1 \geq -x - 3$. (2)

[13]

QUESTION 5

The graph of $f(x) = a^x$, $a > 1$ is shown below. $T(2; 9)$ lies on f .



- 5.1 Calculate the value of a . (2)
- 5.2 Determine the equation of $g(x)$ if $g(x) = f(-x)$. (1)
- 5.3 Determine the value(s) of x for which $f^{-1}(x) \geq 2$. (2)
- 5.4 Is the inverse of f a function? Explain your answer. (2)

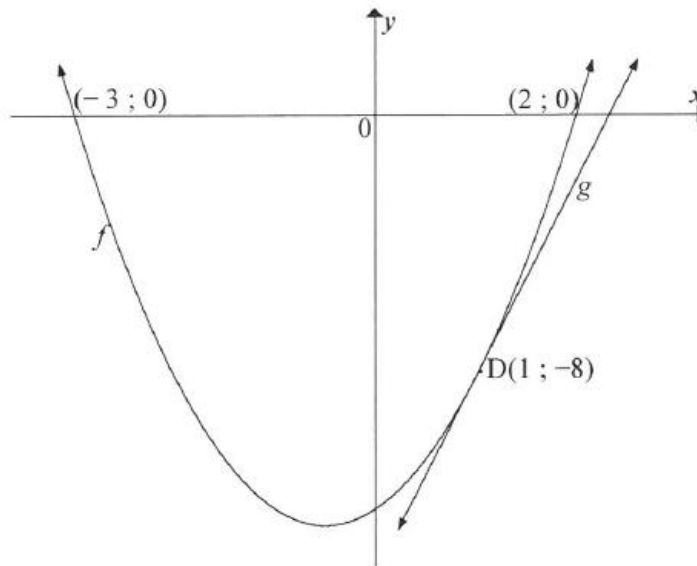
[7]

QUESTION 6

The graphs of $f(x) = ax^2 + bx + c$; $a \neq 0$ and $g(x) = mx + k$ are drawn below.

$D(1 ; -8)$ is a common point on f and g .

- f intersects the x -axis at $(-3 ; 0)$ and $(2 ; 0)$.
- g is the tangent to f at D .



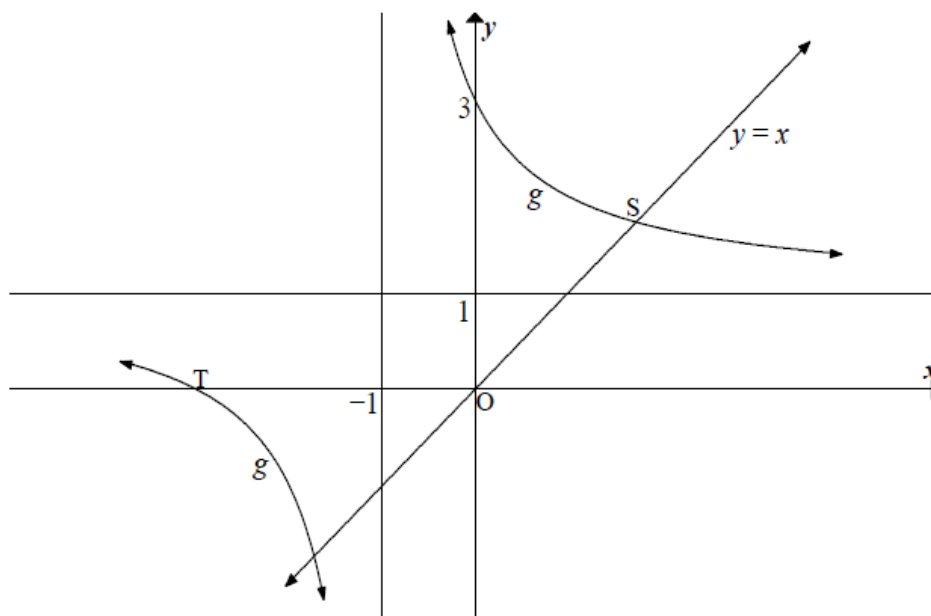
- 6.1 For which value(s) of x is $f(x) \leq 0$? (2)
- 6.2 Determine the values of a , b and c . (5)
- 6.3 Determine the coordinates of the turning point of f . (3)
- 6.4 Write down the equation of the axis of symmetry of h if $h(x) = f(x - 7) + 2$. (2)
- 6.5 Calculate the gradient of g . (3)

[15]

KWV 11

QUESTION 4

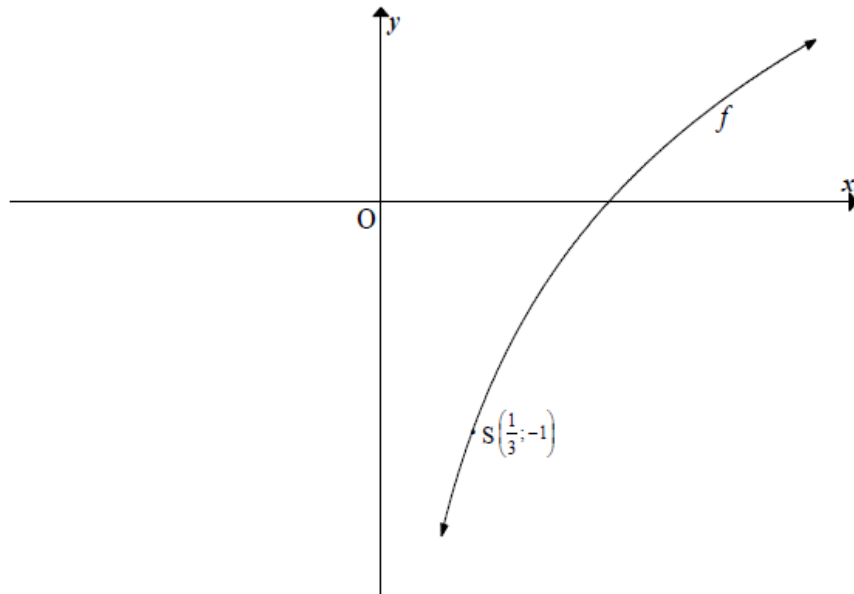
The diagram below shows the hyperbola g defined by $g(x) = \frac{2}{x+p} + q$ with asymptotes $y = 1$ and $x = -1$. The graph of g intersects the x -axis at T and the y -axis at $(0; 3)$. The line $y = x$ intersects the hyperbola in the first quadrant at S .



- 4.1 Write down the values of p and q . (2)
- 4.2 Calculate the x -coordinate of T . (2)
- 4.3 Write down the equation of the vertical asymptote of the graph of h , if $h(x) = g(x+5)$ (1)
- 4.4 Calculate the length of OS . (5)
- 4.5 For which values of k will the equation $g(x) = x + k$ have two real roots that are of opposite signs? (1)
- [11]

QUESTION 5

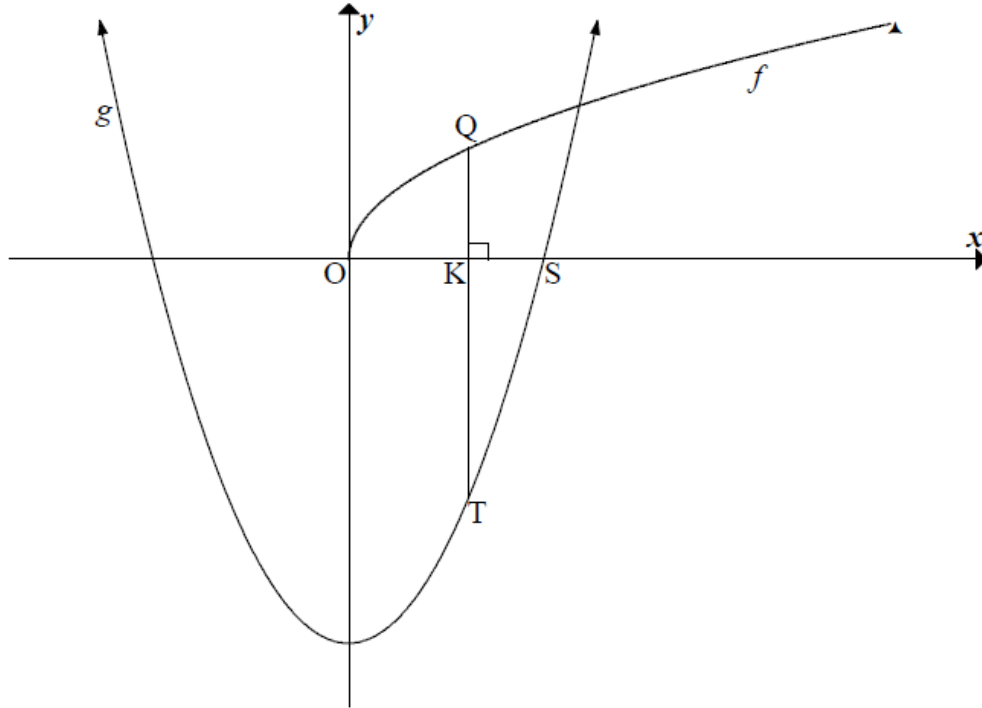
Given: $f(x) = \log_a x$ where $a > 0$. $S\left(\frac{1}{3}; -1\right)$ is a point on the graph of f .



- 5.1 Prove that $a = 3$. (2)
- 5.2 Write down the equation of h , the inverse of f , in the form $y = \dots$ (2)
- 5.3 If $g(x) = -f(x)$, determine the equation of g . (1)
- 5.4 Write down the domain of g . (1)
- 5.5 Determine the values of x for which $f(x) \geq -3$. (3)
- [9]

QUESTION 6

Given: $g(x) = 4x^2 - 6$ and $f(x) = 2\sqrt{x}$. The graphs of g and f are sketched below. S is an x -intercept of g and K is a point between O and S . The straight line QKT with Q on the graph of f and T on the graph of g , is parallel to the y -axis.



- 6.1 Determine the x -coordinate of S , correct to TWO decimal places. (2)
- 6.2 Write down the coordinates of the turning point of g . (2)
- 6.3 6.3.1 Write down the length of QKT in terms of x , where x is the x -coordinate of K . (3)
- 6.3.2 Calculate the maximum length of QT . (6)
- [13]

KWV 12

QUESTION 6

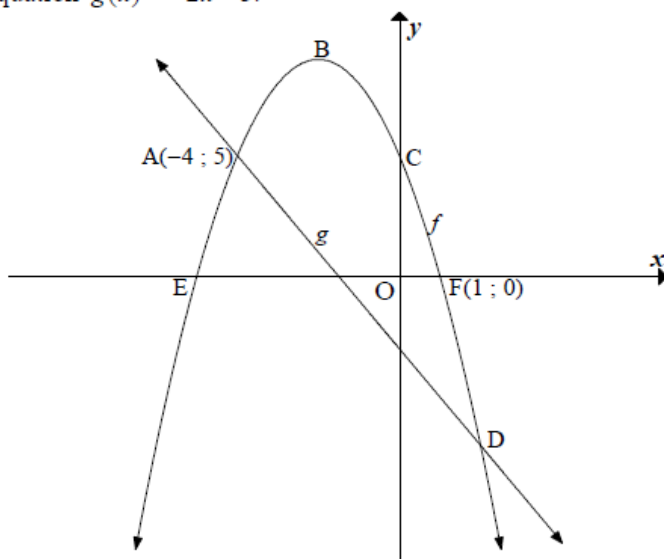
Consider: $f(x) = \frac{6}{x-2} + 3$

- 6.1 Write down the equations of the asymptotes of the graph of f . (2)
- 6.2 Write down the domain of f . (1)
- 6.3 Draw a sketch graph of f in your ANSWER BOOK, indicating the intercept(s) with the axes and the asymptotes. (4)
- 6.4 The graph of f is translated to g . Describe the transformation in the form $(x; y) \rightarrow \dots$ if the axes of symmetry of g are $y = x + 3$ and $y = -x + 1$. (4)
- [11]

QUESTION 7

The graph of $f(x) = a(x - p)^2 + q$ where a, p and q are constants, is given below.

Points E, F(1 ; 0) and C are its intercepts with the coordinates axes. A(-4 ; 5) is the reflection of C across the axis of symmetry of f . D is a point on the graph such that the straight line through A and D has equation $g(x) = -2x - 3$.

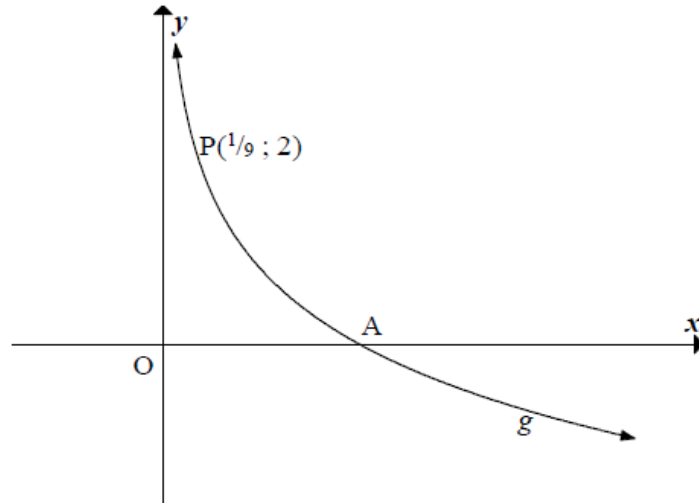


- 7.1 Write down the coordinates of C. (1)
- 7.2 Write down the equation of the axis of symmetry of f . (1)
- 7.3 Calculate the values of a, p and q . (6)
- 7.4 If $f(x) = -x^2 - 4x + 5$, calculate the x-coordinate of D. (4)
- 7.5 The graph of f is reflected about the x-axis.
Write down the coordinates of the turning point of the new parabola. (2)
- [14]

QUESTION 8

Given the graph of $g(x) = \log_{\frac{1}{3}} x$.

- A is the x-intercept of g .
- P $\left(\frac{1}{9}; 2\right)$ is a point on g .



- 8.1 Write down the coordinates of A. (1)
- 8.2 Sketch the graph of g^{-1} indicating an intercept with the axes and ONE other point on the graph. (3)
- 8.3 Write down the domain of g^{-1} . (1)
- [5]

KWV 13

QUESTION 4

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

4.1.1 Calculate the coordinates of the y -intercept of f . (2)

4.1.2 Calculate the coordinates of the x -intercept of f . (2)

4.1.3 Sketch the graph of f in your ANSWER BOOK, showing clearly the asymptotes and the intercepts with the axes. (3)

4.1.4 One of the axes of symmetry of f is a decreasing function. Write down the equation of this axis of symmetry. (2)

4.2 The graph of an increasing exponential function with equation $f(x) = ab^x + q$ has the following properties:

- Range: $y > -3$
- The points $(0; -2)$ and $(1; -1)$ lie on the graph of f .

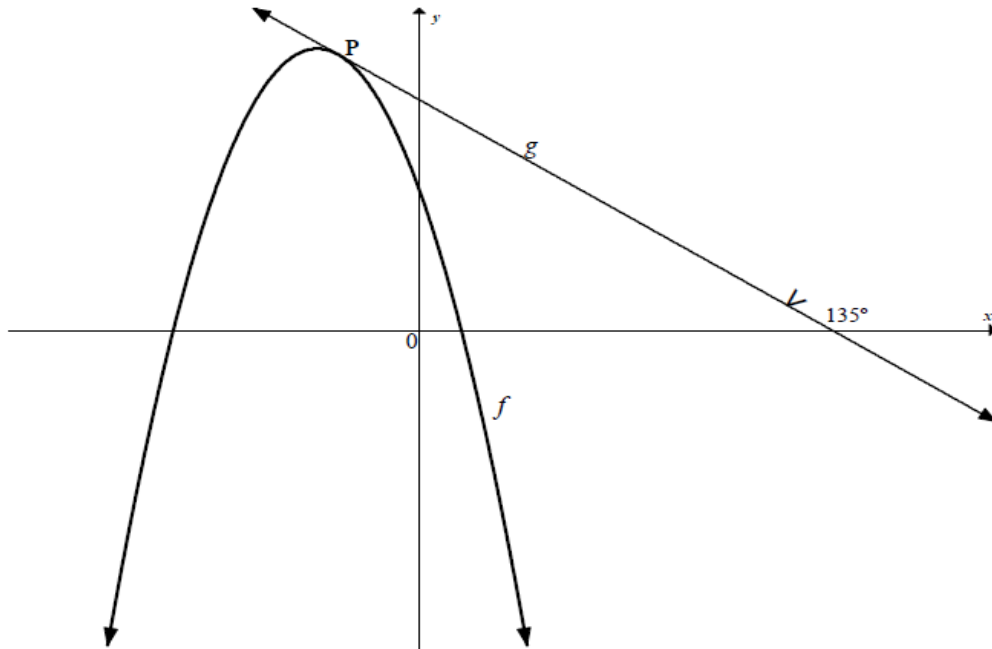
4.2.1 Determine the equation that defines f . (4)

4.2.2 Describe the transformation from $f(x)$ to $h(x) = 2 \cdot 2^x + 1$ (2)

[15]

QUESTION 5

The sketch below shows the graphs of $f(x) = -2x^2 - 5x + 3$ and $g(x) = ax + q$. The angle of inclination of graph g is 135° in the direction of the positive x -axis. P is the point of intersection of f and g such that g is a tangent to the graph of f at P .



- 5.1 Calculate the coordinates of the turning point of the graph of f . (3)
- 5.2 Calculate the coordinates of P , the point of contact between f and g . (4)
- 5.3 Hence or otherwise, determine the equation of g . (2)
- 5.4 Determine the values of d for which the line $k(x) = -x + d$ will not intersect the graph of f . (1)
- [10]**

QUESTION 6

The graph of g is defined by the equation $g(x) = \sqrt{ax}$. The point $(8 ; 4)$ lies on g .

- 6.1 Calculate the value of a . (2)
- 6.2 If $g(x) > 0$, for what values of x will g be defined? (1)
- 6.3 Determine the range of g . (1)
- 6.4 Write down the equation of g^{-1} , the inverse of g , in the form $y = \dots$ (2)
- 6.5 If $h(x) = x - 4$ is drawn, determine ALGEBRAICALLY the point(s) of intersection of h and g . (4)
- 6.6 Hence, or otherwise, determine the values of x for which $g(x) > h(x)$. (2)
- [12]**

KWV 14

QUESTION 5

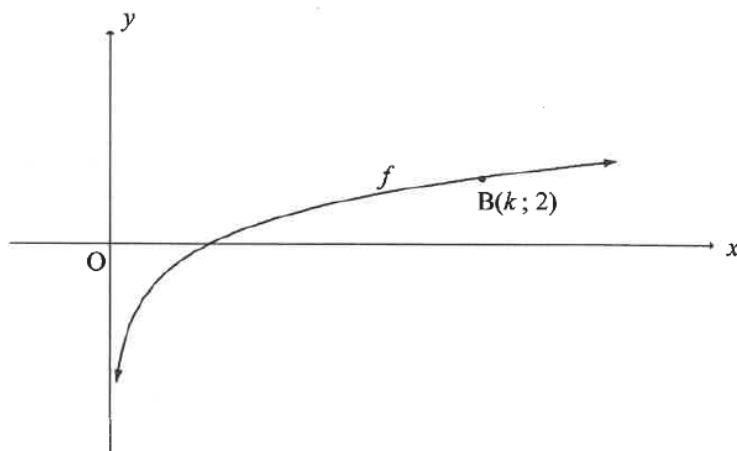
Given: $f(x) = \frac{-1}{x-3} + 2$

- 5.1 Write down the equations of the asymptotes of f .
- 5.2 Write down the domain of f .
- 5.3 Determine the coordinates of the x -intercept of f .
- 5.4 Write down the coordinates of the y -intercept of f .
- 5.5 Draw the graph of f . Clearly show ALL the asymptotes and intercepts with the axes.

QUESTION 6

The graph of $f(x) = \log_4 x$ is drawn below.

$B(k; 2)$ is a point on f .



- 6.1 Calculate the value of k . (2)
 - 6.2 Determine the values of x for which $-1 \leq f(x) \leq 2$. (2)
 - 6.3 Write down the equation of f^{-1} , the inverse of f , in the form $y = \dots$ (2)
 - 6.4 For which values of x will $x \cdot f^{-1}(x) < 0$? (2)
- [8]**

QUESTION 7

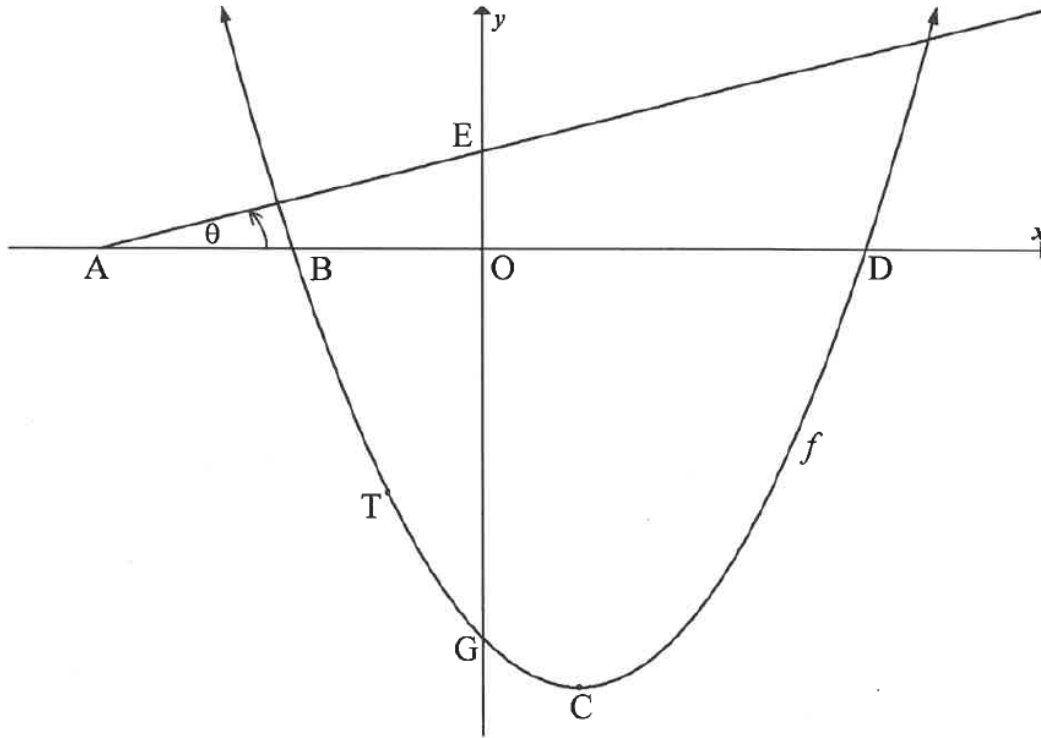
The graph of $f(x) = (x + 4)(x - 6)$ is drawn below.

The parabola cuts the x -axis at B and D and the y -axis at G.

C is the turning point of f .

Line AE has an angle of inclination of θ and cuts the x -axis and y -axis at A and E respectively.

T is a point on f between B and G.



- 7.1 Write down the coordinates of B and D. (2)
- 7.2 Calculate the coordinates of C. (2)
- 7.3 Write down the range of f . (1)
- 7.4 Given that $\theta = 14,04^\circ$ and the tangent to f at T is perpendicular to AE.
- 7.4.1 Calculate the gradient of AE, correct to TWO decimal places. (1)
- 7.4.2 Calculate the coordinates of T. (5)
- 7.5 A straight line, g , parallel to AE, cuts f at $K(-3; -9)$ and R. Calculate the x -coordinate of R. (6)
- [17]

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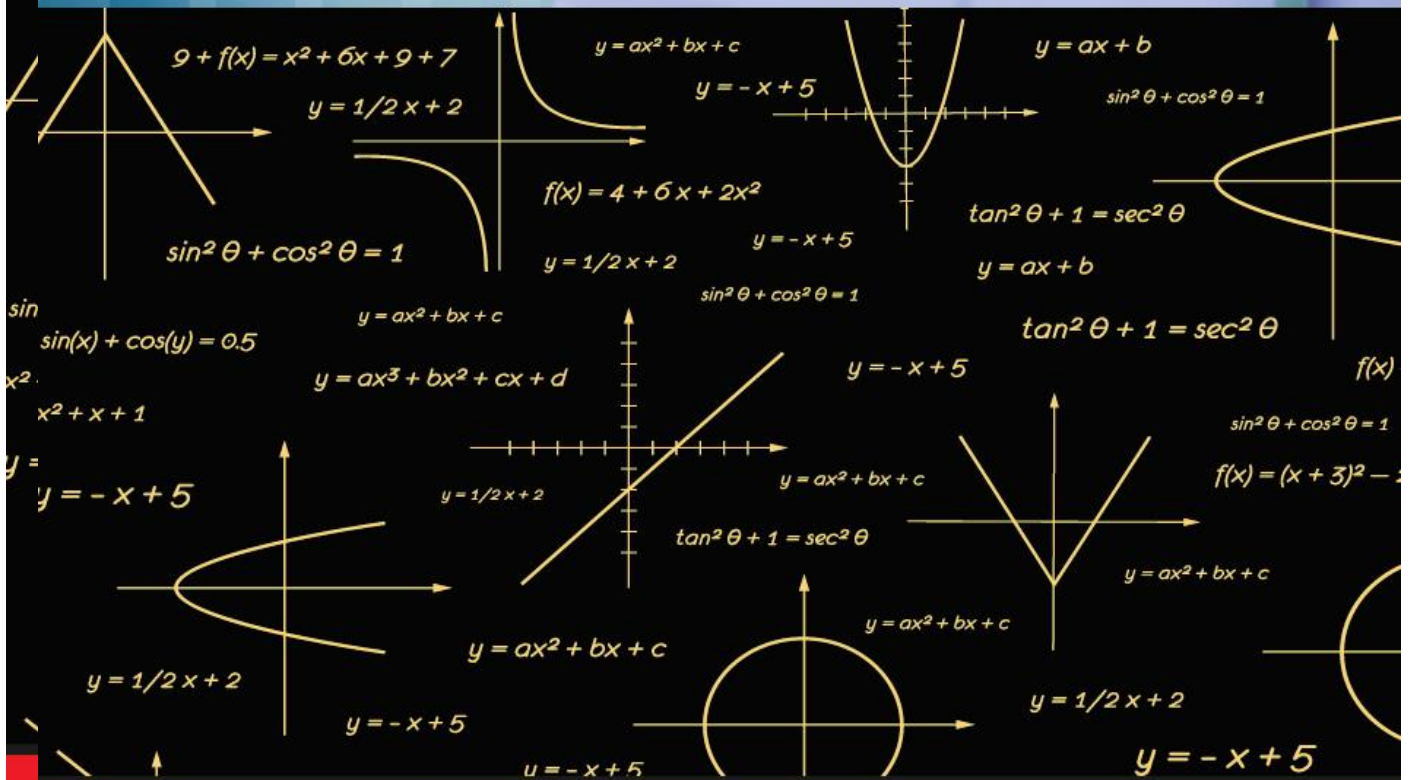


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