

FUNCTIONS & GRAPHS

MATHEMATICS GRADE 10

REVISION PACK

PAST PAPERS

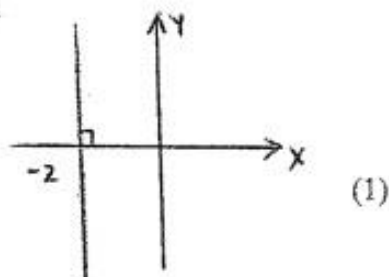
JANUARY 1, 2018

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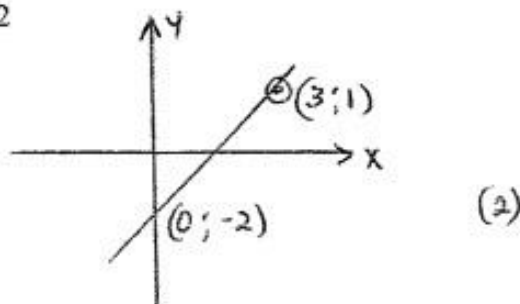
QUESTION 8 (MAY 07 WBH)

Write down the equations of each of the following straight lines.

8.1



8.2

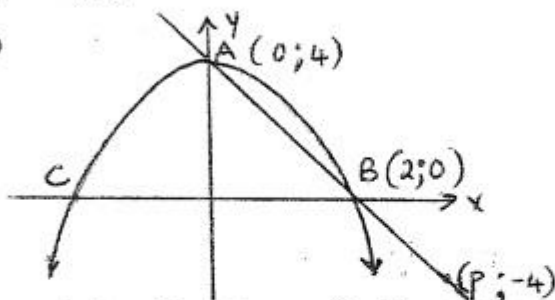


8.3 Find the equation of the straight line which is parallel to $3x - 2y = 1$ with a y intercept of -6 (3)

8.4 Find the equation of the line which is perpendicular to $2y = x - 1$, passing through the point (0;3) (3)

9

Question 9



Refer to the graph alongside where straight line AB has been drawn as well as a parabola in the form $y = ax^2 + q$. $A = (0; 4)$ and $B = (2; 0)$

9.1 Find the equation of line AB (2)

9.2 Write down the coordinates of point C (2)

9.3 Find the equation of the parabola passing through A, B and C (3)

9.4 Find the length of AB, correct to 2 decimal places (2)

9.5 Find the value of p if the point $(p; -4)$ lies on the line AB (2)

11

QUESTION 6 (NOV 15)

Given: $f(x) = ax^2 + c$

f passes through the x-axis at $(d-5)$ and $(d-1)$, where $d \in R$.

6.1 Determine the value of d . (2)

6.2 Determine the values of a and c if it is also given that $f(1) = -9$. (4)
[6]

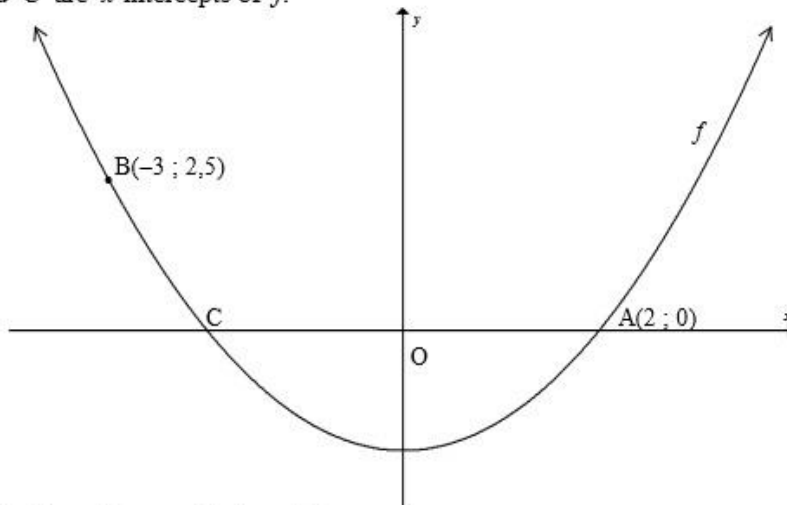
QUESTION 6 (EXEMPLAR 12)

Given: $f(x) = \frac{3}{x} + 1$ and $g(x) = -2x - 4$

- 6.1 Sketch the graphs of f and g on the same set of axes. (4)
 - 6.2 Write down the equations of the asymptotes of f . (2)
 - 6.3 Write down the domain of f . (2)
 - 6.4 Solve for x if $f(x) = g(x)$. (5)
 - 6.5 Determine the values of x for which $-1 \leq g(x) < 3$. (3)
 - 6.6 Determine the y -intercept of k if $k(x) = 2g(x)$. (2)
 - 6.7 Write down the coordinates of the x - and y -intercepts of h if h is the graph of g reflected about the y -axis. (2)
- [20]**

QUESTION 7 (EXEMPLAR 12)

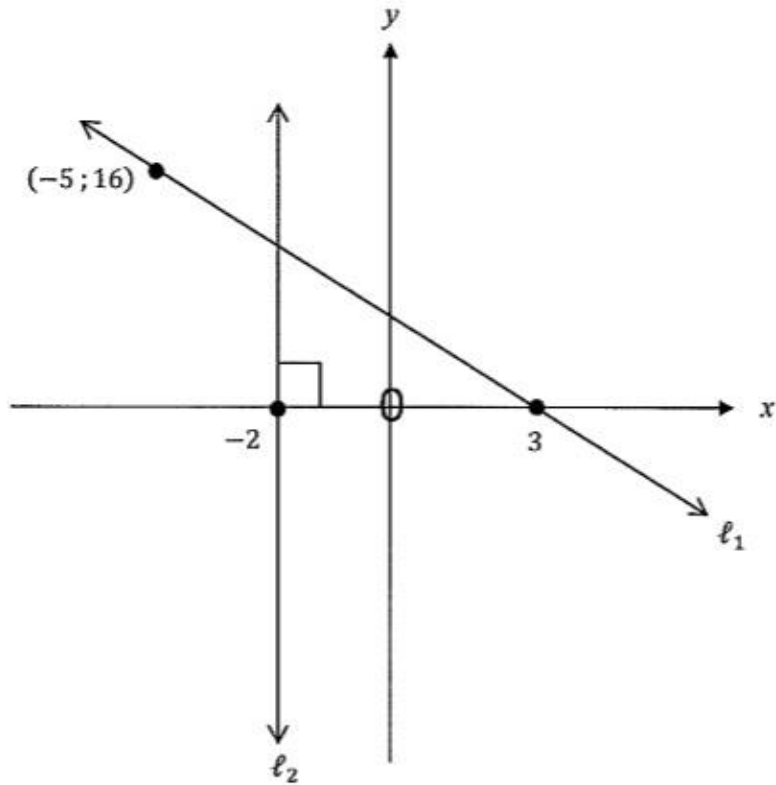
The graph of $f(x) = ax^2 + q$ is sketched below.
 Points A(2 ; 0) and B(-3 ; 2,5) lie on the graph of f .
 Points A and C are x -intercepts of f .



- 7.1 Write down the coordinates of C. (1)
 - 7.2 Determine the equation of f . (3)
 - 7.3 Write down the range of f . (1)
 - 7.4 Write down the range of h , where $h(x) = -f(x) - 2$. (2)
 - 7.5 Determine the equation of an exponential function, $g(x) = b^x + q$, with range $y > -4$ and which passes through the point A. (3)
- [10]**

QUESTION 6 (JUNE 12 HUD)

6.1. Determine the equations of the lines labelled ℓ_1 and ℓ_2 :



(4)

6.2. On separate sets of axes, sketch rough graphs of the following straight lines :

6.2.1. $3x + 2y = 12$ 2

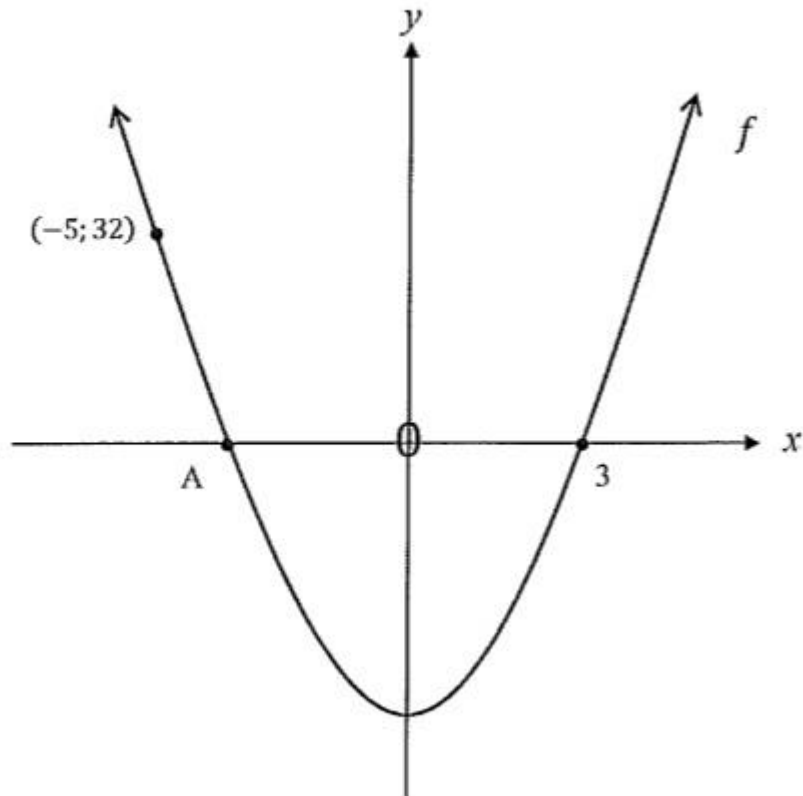
6.2.2. $y = -\frac{2}{3}x$ 2

6.2.3. $y = 3$ 1 (5)

[9]

QUESTION 8 (NOV 12 HUD)

8. The axis of symmetry of the parabola, f , shown below, is $x = 0$.



- 8.1. Write down the coordinates of A. (1)
- 8.2. Determine the equation of f . (3)
- 8.3. What is the minimum value of f ? (1)
- 8.4. State the values of x for which f is decreasing. (1)
- 8.5. A parabola is also called the “quadratic function”.
Complete the following statements, by writing down only that which is missing :
- 8.5.1. “Quadratic” indicates that the highest power of x , in the defining equation of f , is 1
- 8.5.2. A “function” is a rule (relationship) between x and y , which is such that each 1 (2)

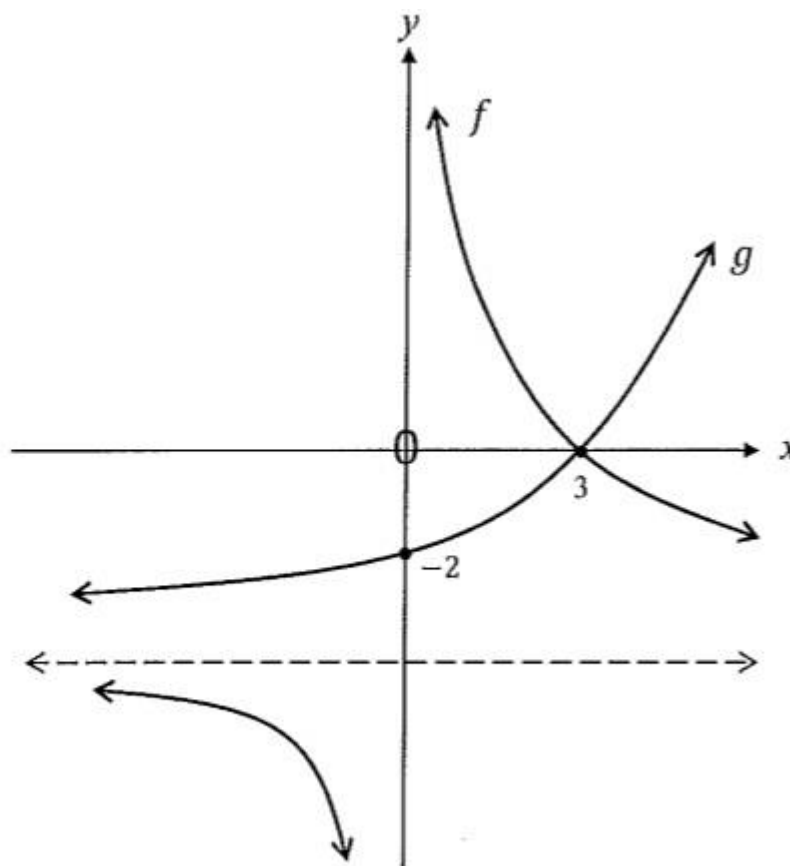
[8]

QUESTION 9 (NOV 12 HUD)

9. Shown below are the graphs of :

$$f(x) = \frac{k}{x} + q \quad \text{and} \quad g(x) = a \cdot b^x + q$$

f and g have the same horizontal asymptote of $y = -4$:



- 9.1 Calculate the values of q , k , a and b . (7)
- 9.2 Use the graphs to solve for x if :
- 9.2.1. $f(x) - g(x) < 0$ 2
- 9.2.2. $f(x) \cdot g(x) \geq 0$ 2 (4)
- 9.3 Write down the range of f . (1)
- 9.4 State the axis of symmetry of h , if: $h(x) = f(x)$ ($x < 0$). (1)

[13]

QUESTION 6 (NOV 12 HUD)

6.1. Given :

$$f(x) = 3x - 7 \quad \text{and} \quad g(x) = 2$$

Determine :

6.1.1. $f(5)$ 1

6.1.2. $g(-1)$ 1 (2)

6.2. Given : $h(x) = -3x + 2$

Solve for x , if: $2h(x + 4) - 5x = 6$ (2)

[4]

6.2. On separate sets of axes, sketch rough graphs of the following straight lines :

6.2.1. $3x + 2y = 12$ 2

6.2.2. $y = -\frac{2}{3}x$ 2

6.2.3. $y = 3$ 1 (5)

[9]

QUESTION 9 (NOV 13 HUD)

Draw rough graphs of the following, on a separate set of axis.

9.1) $y = ax^2 + q$ if $a < 0$ and $q = 0$ (2)

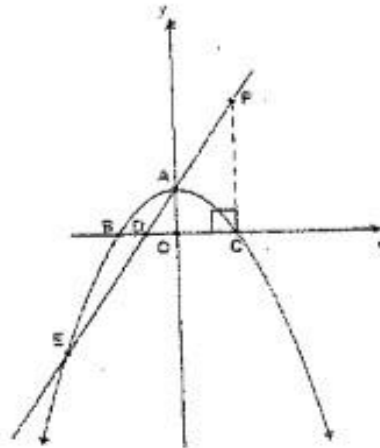
9.2) $y = \frac{k}{x} + q$ if $k > 0$ and $q < 0$ (3)

9.3) $y = ax + q$ if $a < 0$ and $q < 0$ (2)

[7]

QUESTION 10 (NOV 13 HUD)

The graphs of $f(x) = 1 - x^2$ and $g(x) = 2x + 1$ are sketched below.
Using the graphs answer the questions which follow.



10.1) Calculate the co-ordinates of A. (2)

10.2) Calculate the co-ordinates of B (2)

10.3) Determine the co-ordinates of E (4)

10.4) For which values of x is:

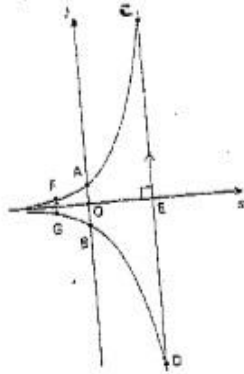
10.4.1) $g(x) \geq f(x)$ (4)

10.4.2) $f(x)$ increasing (2)

[14]

QUESTION 11 (NOV 13 HUD)

Sketched are the graphs $y = 3^x$ and $y = -3^x$. FG and CED are line segments parallel to the y -axis. F, G, C and D lie on the graphs.



11.1.1) Calculate the co-ordinates of A and B. (2)

11.1.2) Calculate CD if OE = 2 units (3)

11.2) Given $f(x) = \frac{-5}{x} + 6$

11.2.1) What is the equation of the horizontal asymptote of $f(x)$? (1)

11.2.2) Draw a sketch of $f(x)$ clearly indicating all intercepts and asymptotes (4)

11.2.3) What is the domain of $f(x)$? (1)

11.2.4) State the equation of the axis of symmetry of g if

$$g(x) = f(x) \quad (x > 0) \quad (2)$$

[13]

QUESTION 4 (NOV 15)

$f(x) = -2x^2 + 2$ and $g(x) = 2^x + 1$ are the defining equations of graphs f and g respectively.

- 4.1 Write down an equation for the asymptote of g . (1)
- 4.2 Sketch the graphs of f and g on the same set of axes, clearly showing ALL intercepts with the axes, turning points and asymptotes. (6)
- 4.3 Write down the range of f . (1)
- 4.4 Determine the maximum value of h if $h(x) = 3^{f(x)}$. (2)
- 4.5 What transformation does the graph of $y = f(x)$ undergo in order to obtain the graph of $y = 2x^2 - 2$? (2)
- [12]

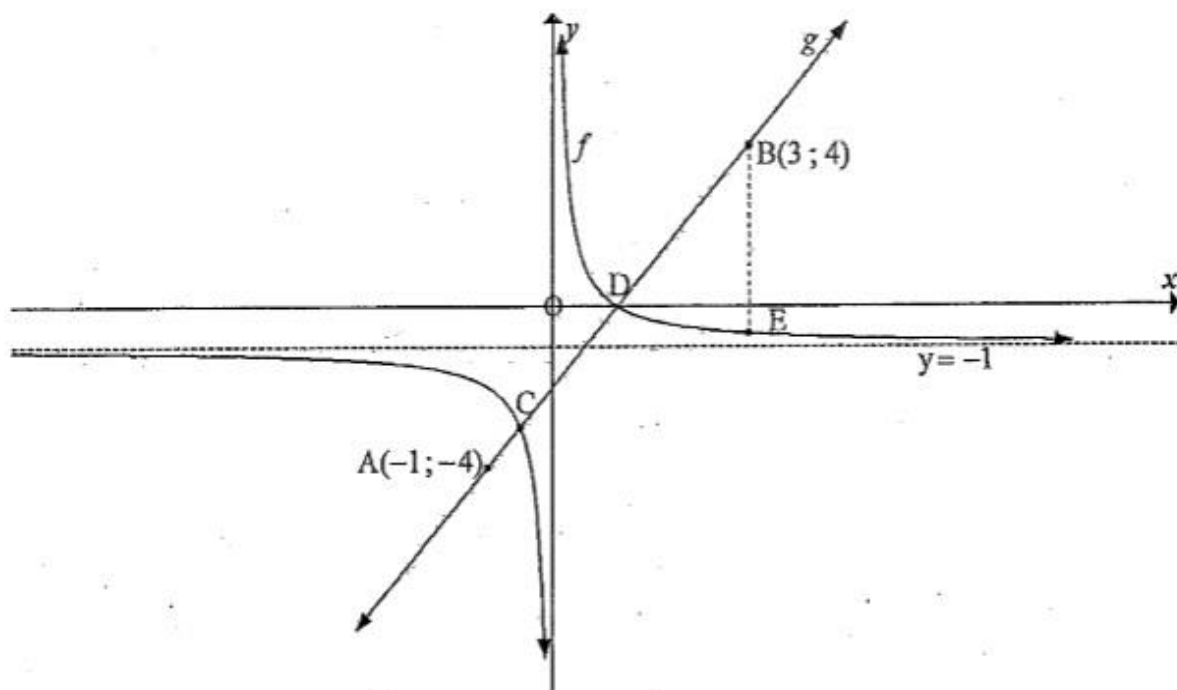
QUESTIONS 5 (NOV 15)

The sketch below shows f and g , the graphs of $f(x) = \frac{1}{x} - 1$ and $g(x) = ax + q$ respectively.

Points $A(-1; -4)$ and $B(3; 4)$ lie on the graph g .

The two graphs intersect at points C and D .

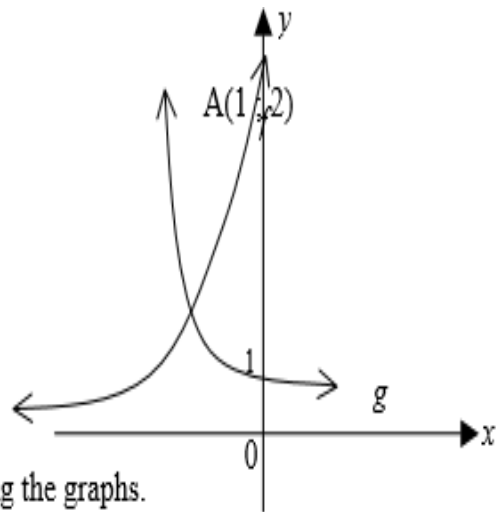
Line BE is drawn parallel to the y -axis, with E on f .



- 5.1 Show that $a = 2$ and $q = -2$. (2)
- 5.2 Determine the values of x for which $f(x) = g(x)$. (4)
- 5.3 For what values of x is $g(x) \geq f(x)$? (3)
- 5.4 Calculate the length of BE. (3)
- 5.5 Write down an equation of h if $h(x) = f(x) + 3$. (1)
- [13]**

QUESTION 6 (EXEMPLAR 06)

- 6.1 The graph of $f(x) = 2^x$ and $g(x) = \frac{k}{x}$ are represented alongside. The graphs intersect at A.



Answer the following questions by using the graphs.

- 6.1.1 What is the domain of f ? (1)
- 6.1.2 Give the equation of the asymptote of the graph of $y = 2^x - 2$. (2)
- 6.1.3 What is the value of k ? (1)

[4]

QUESTION 5 (EXEMPLAR 06)

Given functions $f(x) = -x^2 + 9$ and $g(x) = 3x + 9$

- 5.1 Draw f and g on the same system of axes. (6)
- 5.2 Use your graphs to solve for x if:
- 5.2.1 $f(x) = g(x)$ (2)
- 5.2.2 $f(x) > 0$ (2)
- 5.3 How does the graph of $h(x) = -x^2 - 9$ compare with the graph of $f(x)$? (2)
- 5.4 Give the equation of the reflection of f in the x -axis. (2)
- [14]**

QUESTION 7 (NOV 07)

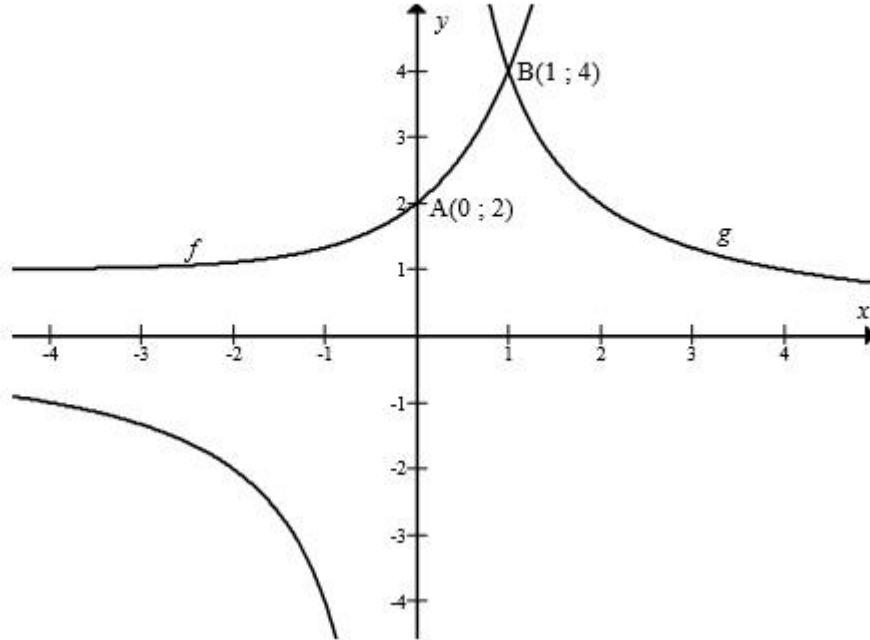
Given: $f(x) = x^2 - 4$ and $g(x) = -2x - 4$

- 7.1 Sketch the graphs of f and g on the same system of axes, showing ALL intercepts with the axes and relevant turning points. (6)
- 7.2 Use your graphs to determine the values of x if:
- 7.2.1 $f(x) = g(x)$ (2)
- 7.2.2 $f(x) < 0$ (2)
- 7.3 How can you use the graph of g to obtain the graph of $k(x) = -2x + 3$? (2)
- [12]**

QUESTION 8 (NOV 07)

Sketched below are the graphs of $f(x) = a^x + 1$ and $g(x) = \frac{k}{x}$.

A is the y -intercept of f and the point B(1 ; 4) is the point of intersection of both f and g .



- 8.1 Write down the equation of the asymptote of f . (1)
- 8.2 What is the range of f ? (2)
- 8.3 Write down the domain of g . (1)
- 8.4 Calculate the value of a . (3)
- 8.5 Determine the value of k . (1)
- 8.6 Write down the equation of h if h is the reflection of g in the y -axis. (2)

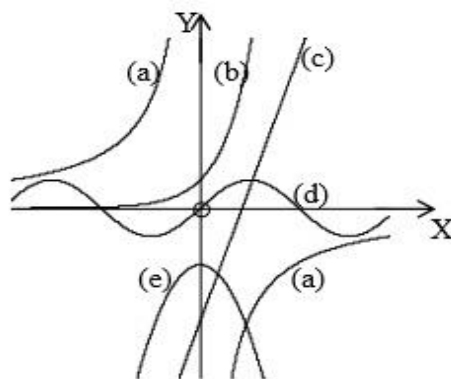
[10]

QUESTION 9 (IEB EXEMPLAR 06)

Refer to the figure where five graphs are shown.

The graphs have standard forms :

- $y = mx + c$
- $y = a^x$
- $y = ax^2 + q$
- $y = \frac{k}{x}$
- $y = a \sin x$



Write down for each graph (a), (b), etc. Which standard form matches it?

(5)

QUESTION 10 (IEB EXEMPLAR 06)

Refer to the figure.

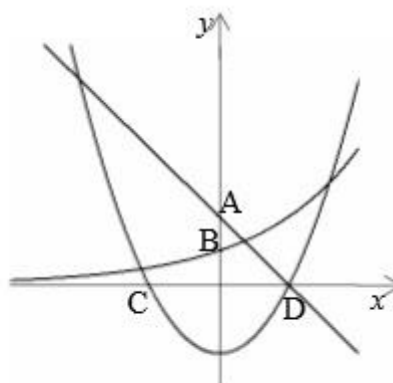
Sketched (not drawn to scale)
are graphs of :

$$f(x) = 2 - 2x,$$

$$g(x) = 2^x$$

and

$$h(x) = 2x^2 - 2$$

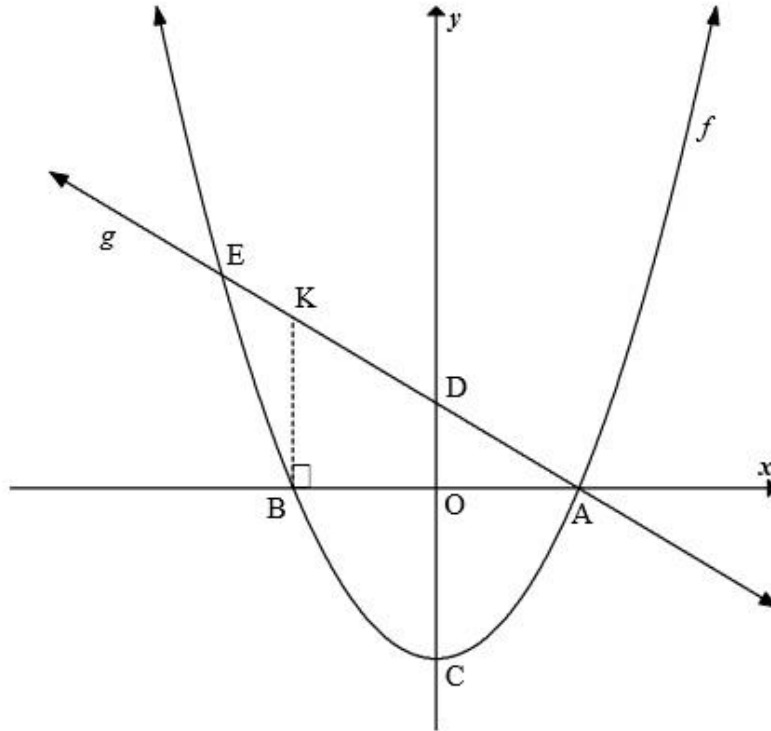


- (a) Find the length of AB. (2)
- (b) Find the length of CD. (3)
- (c) Determine the equation of a new graph : $j(x)$,
the reflection of $h(x)$ about the x -axis. (2)
- (d) Determine the equation of a new graph : $k(x)$,
the reflection of $f(x)$ about the line $y = x$. (2)
- (e) Without changing the shape or symmetry about the y -axis of any of the graphs,
they need to be moved so that they all have a y -intercept at the origin.
Give the new equation for each of the original graphs. (3)

[12]

QUESTION 5(NOV 16)

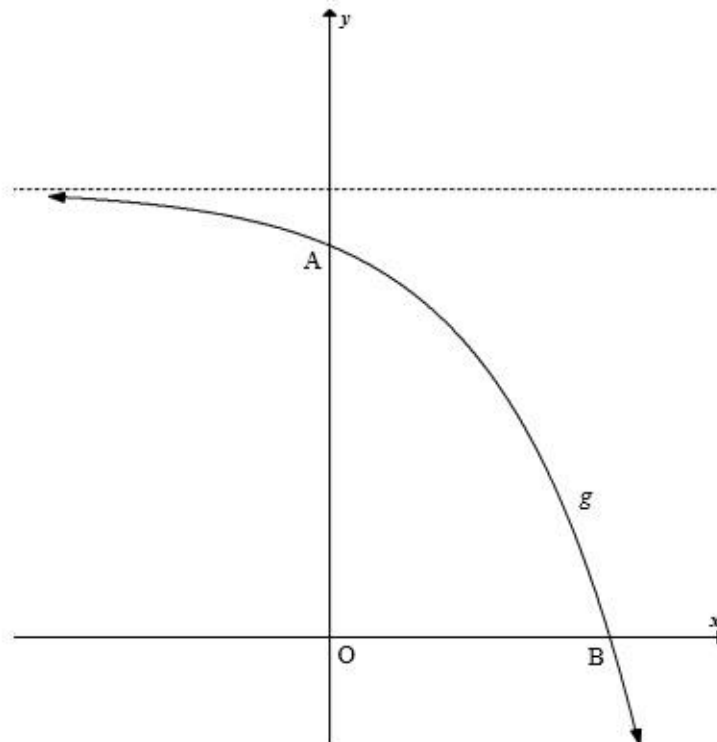
The graphs of $f(x) = x^2 - 4$ and $g(x) = -x + 2$ are sketched below. A and B are the x -intercepts of f . C and D are the y -intercepts of f and g respectively. K is a point on g such that $BK \parallel x$ -axis. f and g intersect at A and E.



- | | | |
|-------|--|-------------|
| 5.1 | Write down the coordinates of C. | (1) |
| 5.2 | Write down the coordinates of D. | (1) |
| 5.3 | Determine the length of CD. | (1) |
| 5.4 | Calculate the coordinates of B. | (3) |
| 5.5 | Determine the coordinates of E, a point of intersection of f and g . | (4) |
| 5.6 | For which values of x will: | |
| 5.6.1 | $f(x) < g(x)$ | (2) |
| 5.6.2 | $f(x).g(x) \geq 0$ | (2) |
| 5.7 | Calculate the length of AK. | (4) |
| | | [18] |

QUESTION 6 (NOV 16)

The graph of $g(x) = -2^x + 8$ is sketched below. A and B are the y - and x -intercepts respectively of g .



- 6.1 Write down the range of g . (1)
- 6.2 Determine the coordinates of B. (3)
- 6.3 If g is reflected over the x -axis to form a new graph h , determine the equation of h . (2)
- 6.4 Explain why the x -intercepts of g and h are both at B. (2)
- [8]**

QUESTION 7 (NOV 16)

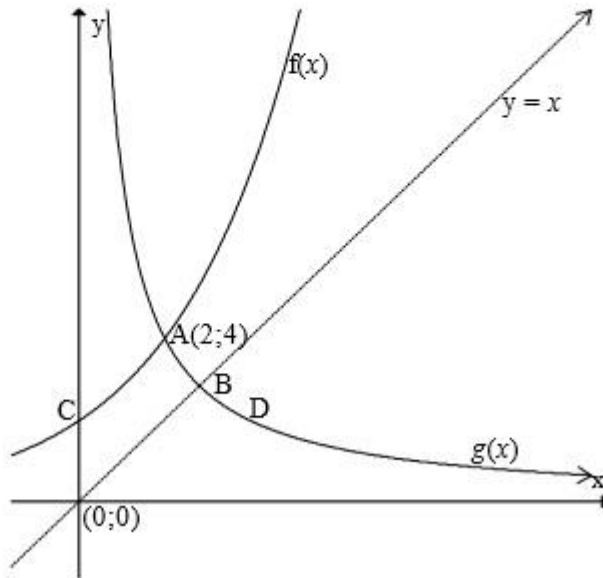
A hyperbola, h , is described with the following characteristics:

- The equation of the vertical asymptote is $x = 0$
- The range of h is $(-\infty; 3) \cup (3; \infty)$
- The x -intercept of h is $(2; 0)$

Determine the equation of h . **[4]**

QUESTION 5 (EXEMPLAR ?)

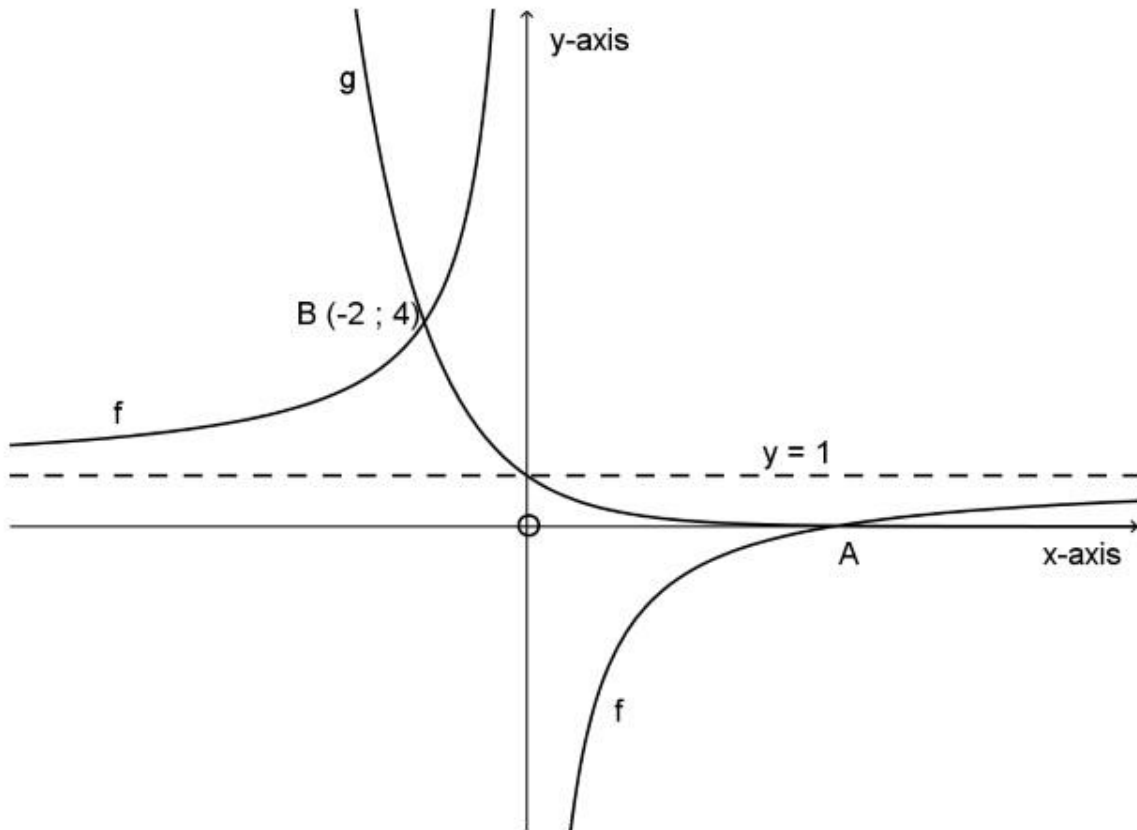
- 5.2 The graphs of $f(x) = a^x$ and $g(x) = \frac{2}{x}$; $x > 0$ are represented in the diagram below. The line $y = x$ is also shown in the diagram



- 5.2.1 Determine the value of a in the equation $f(x) = a^x$. (2)
- 5.2.2 Determine the coordinates of B, the point of intersection of $g(x)$ and the line $y = x$. (2)
- 5.2.3 Determine the coordinates of C, the point of intersection of $f(x)$ and the y -axis. (2)
- 5.2.4 Determine the coordinates of D, the reflection of the point A in the $y = x$ line. (2)
- 5.2.5 What will the coordinates of A become if the graph of $f(x)$ is moved 2 units down. (2)
- 5.2.6 What is the range of $f(x)$? (1)
- [23]**

QUESTION 8 (NOV 15 CURRO)

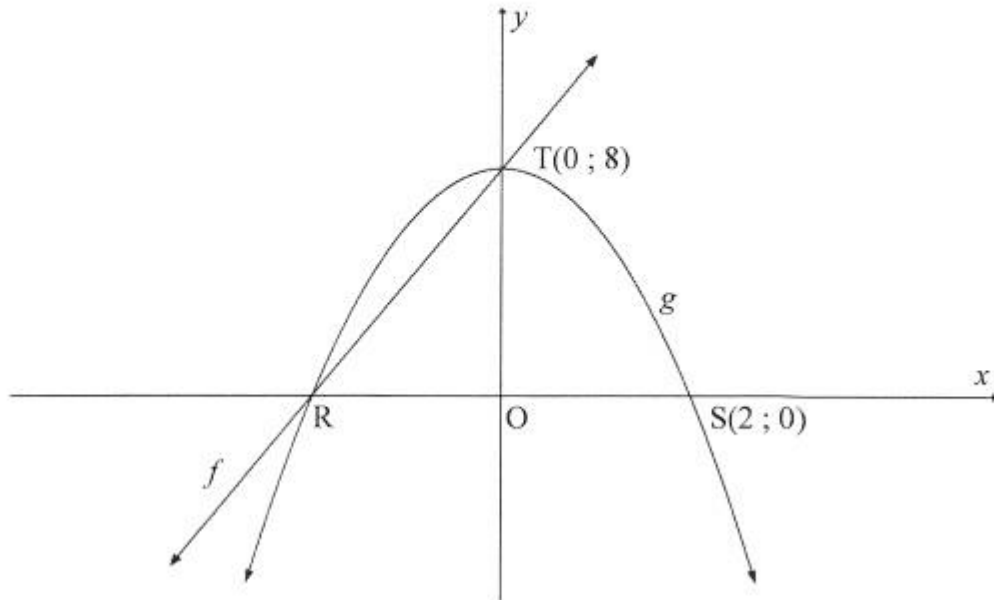
The graphs of $f(x) = \frac{k}{x} + q$ and $g(x) = a^x$ are drawn below. The point B (-2; 4) lies on both graphs.



- 8.1 Find the values of a , q and k . (5)
- 8.2 Determine the length of OA. (2)
- 8.3 What is the range of g ? (1)
- 8.4 If $h(x) = f(x) - 2$, write down the equation of $h(x)$. (1)
- [9]**

QUESTION 5 (NOV 17)

The diagram shows the graphs of $g(x) = ax^2 + q$ and $f(x) = mx + c$.
 R and S(2 ; 0) are the x-intercepts of g and T(0 ; 8) is the y-intercept of g .
 Graph f passes through R and T.



- 5.1 Write down the range of g . (1)
- 5.2 Write down the x -coordinate of R. (1)
- 5.3 Calculate the values of a and q . (3)
- 5.4 Determine the equation of f . (3)
- 5.5 Use the graphs to determine the value(s) of x for which:
- 5.5.1 $f(x) = g(x)$ (2)
- 5.5.2 $x \cdot g(x) \leq 0$ (3)
- 5.6 The graph h is obtained when g is reflected along the line $y = 0$.
 Write down the equation of h in the form $h(x) = px^2 + k$. (2)
- [15]**

QUESTION 6 (NOV 17)

6.1 The function $p(x) = k^x + q$ is described by the following properties:

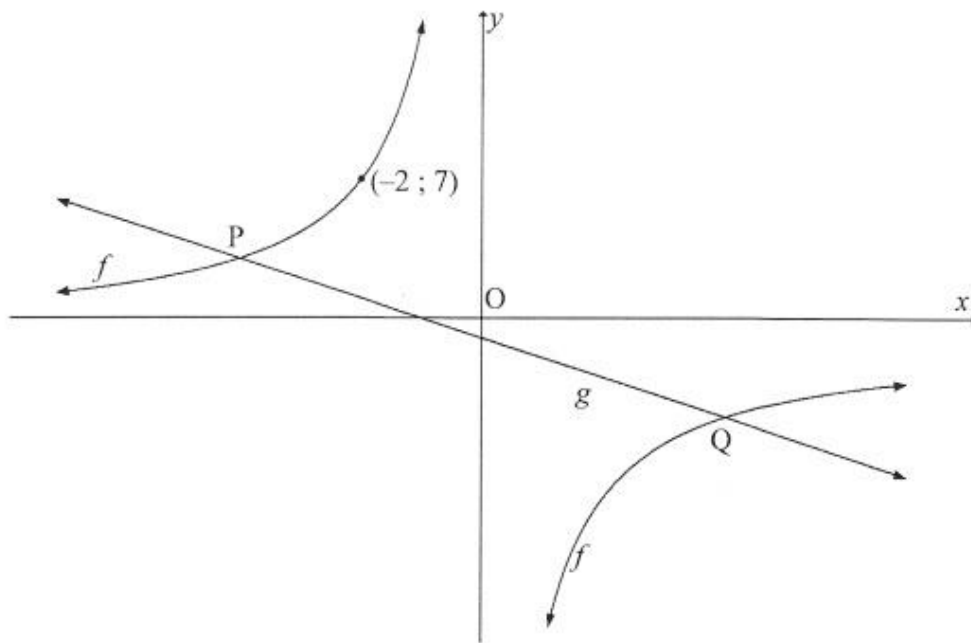
- $k > 0; k \neq 1$
- x -intercept at $(2; 0)$
- The horizontal asymptote is $y = -9$

6.1.1 Write down the range of p . (1)

6.1.2 Determine the equation of p . (3)

6.1.3 Sketch the graph of p . Show clearly the intercepts with the axes and the asymptote. (3)

6.2 The sketch below shows the graphs of $f(x) = \frac{k}{x} + w$ and $g(x) = -x - 1$.
The graph g is an axis of symmetry of f . The graphs f and g intersect at P and Q.



6.2.1 Write down the value of w . (1)

6.2.2 The point $(-2; 7)$ lies on f . Calculate the value of k . (2)

6.2.3 Calculate the x -coordinates of P and Q. (4)

6.2.4 Write down the values of x for which $\frac{-16}{x} > -x$. (2)

[16]

QUESTION 5 (EXEMPLAR ?)

- 5.1 Given the functions: $f(x) = -x^2 + 9$ and $g(x) = 6 - 2x$
- 5.1.1 Draw f and g on the same system of axes. Label all intercepts with the axes. (6)
- 5.1.2 Use your graph to determine for which values of x ; $f(x) \geq 0$ (2)
- 5.1.3 $f(x)$ is reflected in the x -axis. This reflection is given a new name $h(x)$. Draw $h(x)$ on the same system of axes as f and g . Make sure you have labeled each graph carefully. (2)
- 5.1.4 Give the equation of $h(x)$. (2)

[12]

THE END

THANK YOU FOR PRACTICING
MATHEMATICS