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IB Exam Revision - Online

Topic Exam

Functions & Equations

Video Solutions to this exam can be found at:

www.revisionvillage.com/functions-equations-exam

Question 1

[Maximum mark: 6] 

Let $f(x) = x^3$ and $g(x) = 2x - 1$.

(a) Find $g^{-1}(x)$. [2]

(b) Find $g \circ f(x)$. [2]

(c) Solve $g \circ f(x) = 0$. [2]

Question 2

[Maximum mark: 5] 

Let $f(x) = a(x-h)^2 + k$. The vertex of the graph of f is at (3,4) and the graph passes through (1,-4).

(a) Write down the value of h and k. [2]

(b) Find the value of a. [3]

Question 3

[Maximum mark: 7]

Let $f(x) = x^2 - 4x + 3$

(a) For the graph of f, find

(i) y-intercept;

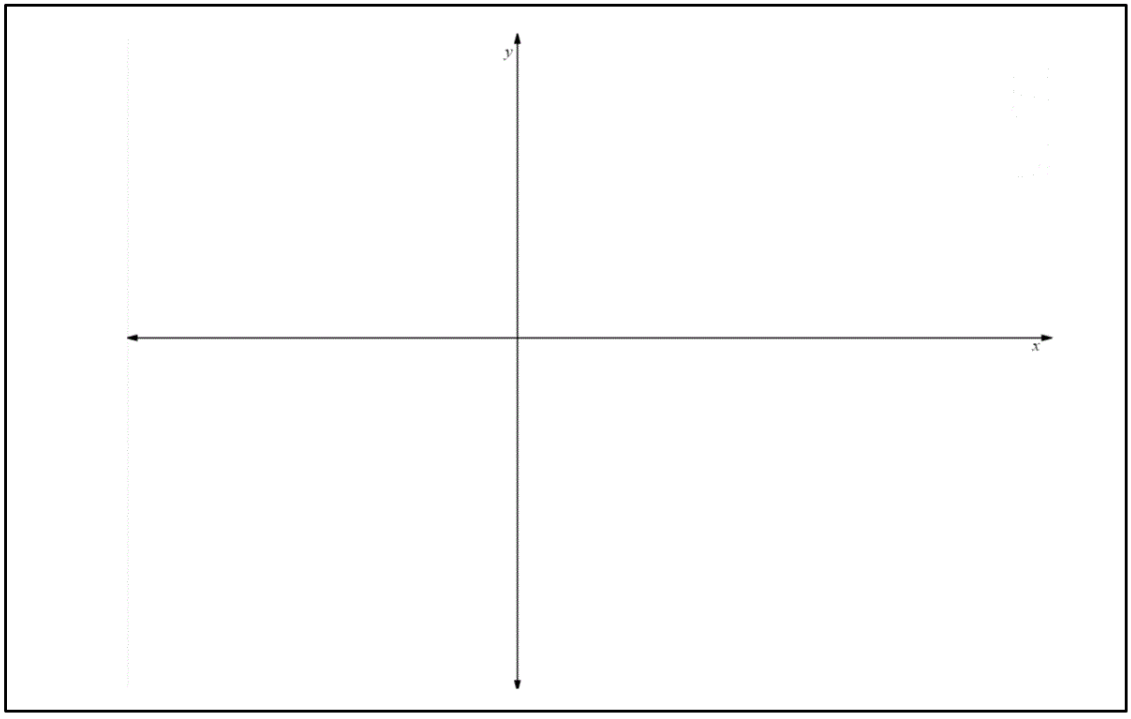
(ii) x-intercepts. [3]

(b) The function can also be expressed in the form $f(x) = (x - h)^2 + k$.

(i) Find the value of h;

(ii) Find the value of k. [2]

(c) Sketch the graph of f on the axis below. Clearly label the intercepts and vertex. [2]



Question 4

[Maximum mark: 6] 

Let $f(x) = \sqrt{x+7}$, for $x \geq -7$.

(a) Find $f^{-1}(3)$. [3]

(b) Let g be a function such that g^{-1} exists for all real numbers. Given that $g(9) = 4$, find $(f \circ g^{-1})(4)$. [3]

Question 5

[Maximum mark: 6] 

Let $f(x) = (x+2)^3$ for $x \in \mathbb{R}$

(a) Find $f^{-1}(x)$ [3]

(b) Let g be a function so that $f \circ g(x) = 27x^6$. Find $g(x)$. [3]

Question 6

[Maximum mark: 7] 

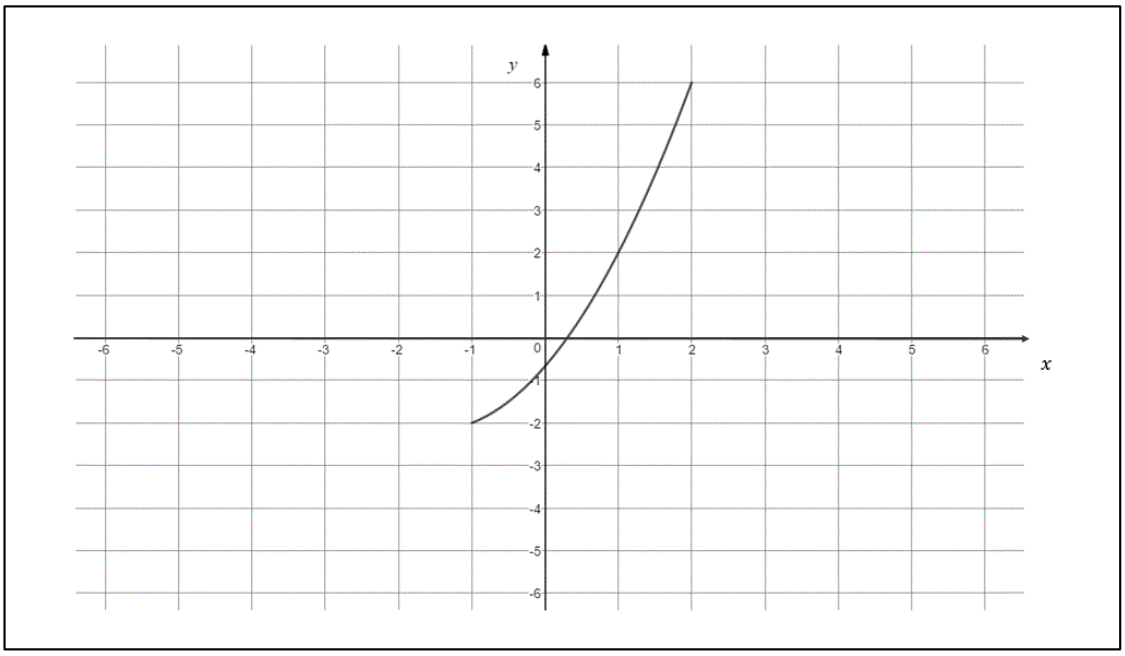
Let $f(x) = x^2 + kx$ and $g(x) = x + k$. The graphs of f and g intersect at two distinct points.

Find the values of k.

Question 7

[Maximum mark: 6]

The following diagram shows the graph of $y = f(x)$.



(a) Write down the value of

(i) $f(1)$;

(ii) $f^{-1}(-2)$. [2]

(b) Find $f \circ f(1)$. [2]

(c) Sketch the graph of $y = f(-x)$ on the grid above. [2]

Question 8

[Maximum mark: 15] 

Let $f(x) = 3x^2 + 12x + 9$

(a) (i) Find the y-intercept of f;

(ii) Find the x-intercepts of f. [4]

The function can be written in the form $f(x) = a(x - h)^2 + k$.

(b) Find the value of

(i) a;

(ii) h;

(iii) k; [5]

(c) (i) Write down the co-ordinate of the vertex of f.

(ii) Write down the equation of the axis of symmetry of f. [2]

(d) The function $g(x)$ is obtained from the graph of f by a reflection in the x-axis, followed by a translation by the vector $\begin{bmatrix} 0 \\ 4 \end{bmatrix}$. Find g, giving your answer in the form $g(x) = Ax^2 + Bx + C$. [4]

Question 9

[Maximum mark: 15]

Let $f(x) = \frac{5}{x+1}$ and $g(x) = x - 3$.

(a) For the graph of f, find

(i) y-intercept;

(ii) x-intercept;

(iii) the equation of the vertical asymptote. [5]

(b) The graph of f and g intersect at $\mathrm{A}(x, y)$ and point $\mathrm{B}(x, y)$. Find the coordinates of points A and B. [5]

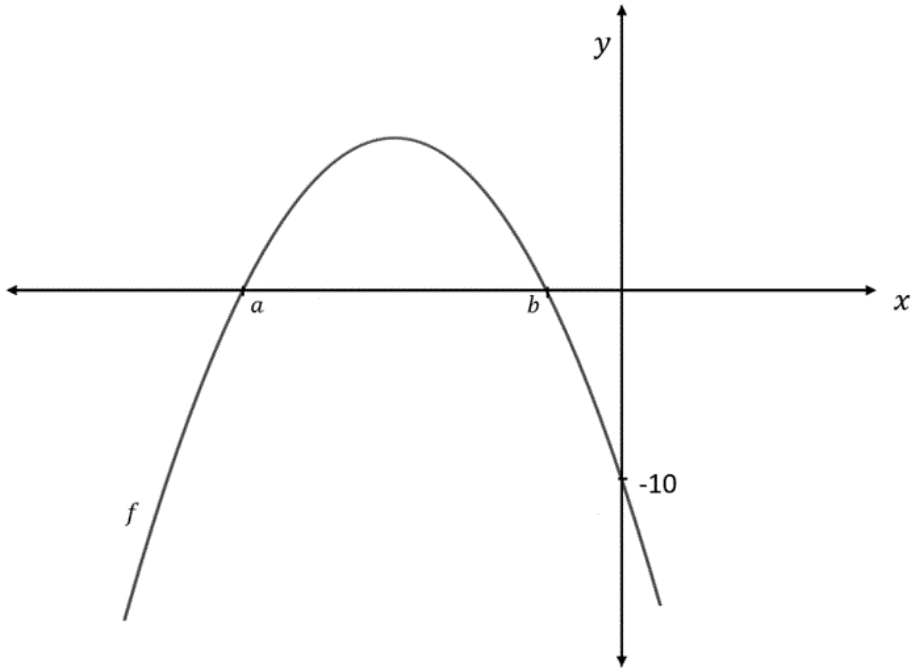
(c) Find the equation of the linear line that passes through A and B, in the form of $y = mx + c$. [3]

(d) Write down the gradient of the line that is perpendicular to the line passing through A and B. [2]

Question 10

[Maximum mark: 15]

Let $f(x) = p(x+1)(x+5)$. The following diagram shows part of the graph of f.



The graph has x-intercepts at $(a, 0)$ and $(b, 0)$, and a y-intercept at $(0, -10)$.

(a) (i) Write down the value of a and of b.

(ii) Find the value of p. [6]

(b) Find the equation of the axis of symmetry. [2]

(c) Find the co-ordinate of the vertex. [3]

(d) Point A(-2,6) lies on the curve of f. The graph of g is obtained from the graph of f by a reflection of f in the y-axis, followed by a translation by the vector $\begin{bmatrix} 0 \\ 2 \end{bmatrix}$. Point A is mapped to the point A' on the graph of g. Find A' [4]