



Higher Mathematics

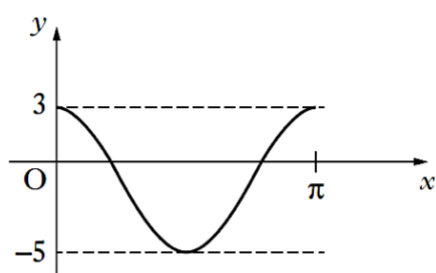
Graph Transformations - Questions

Marks are indicated in brackets after each question number

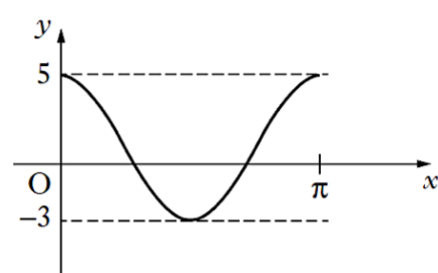
2013 Paper 1 Question 4, (2)

Which of the following shows the graph of $y = 4\cos 2x - 1$, for $0 \leq x \leq \pi$?

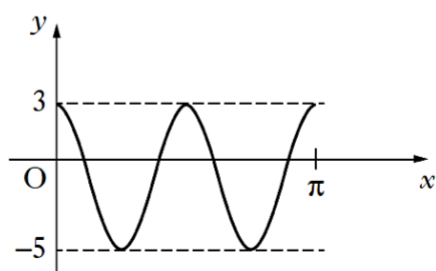
A



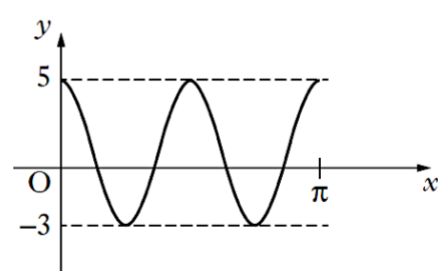
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B



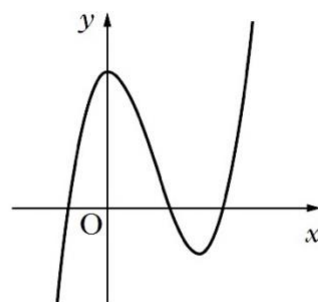
D



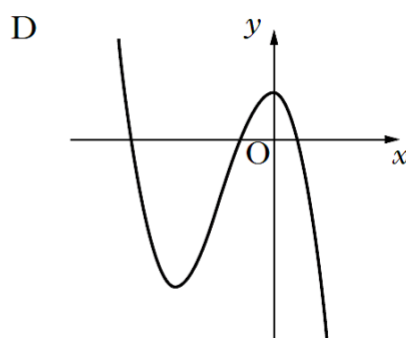
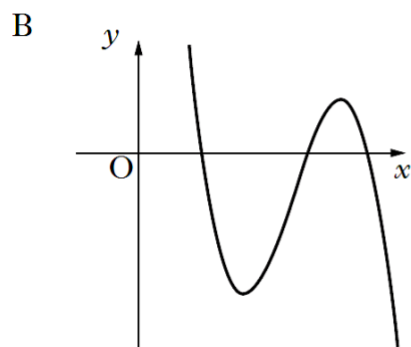
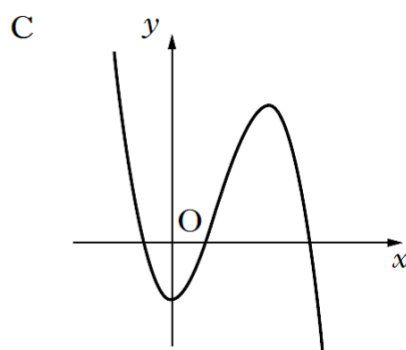
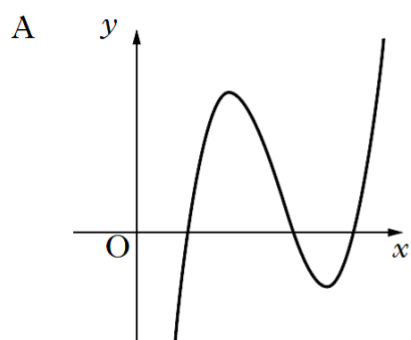


2013 Paper 1 Question 11, (2)

The diagram shows a cubic curve with equation $y = f(x)$.



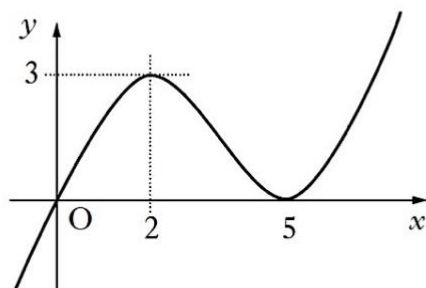
Which of the following diagrams could show the curve with equation $y = -f(x - k)$, $k > 0$?



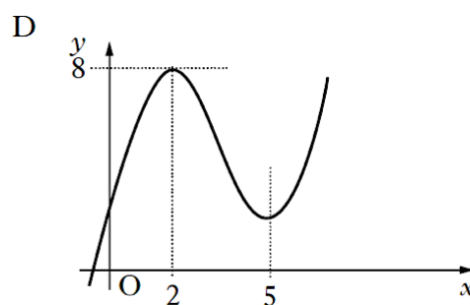
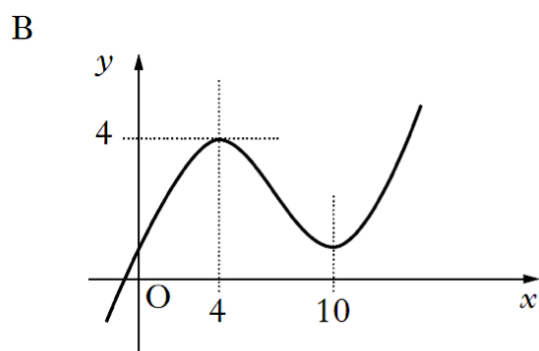
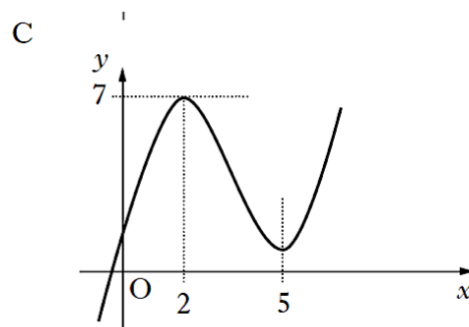
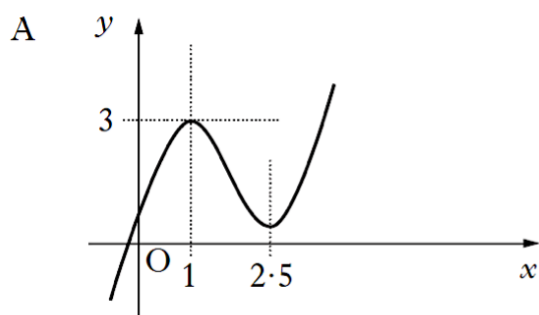


2014 Paper 1 Question 11, (2)

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



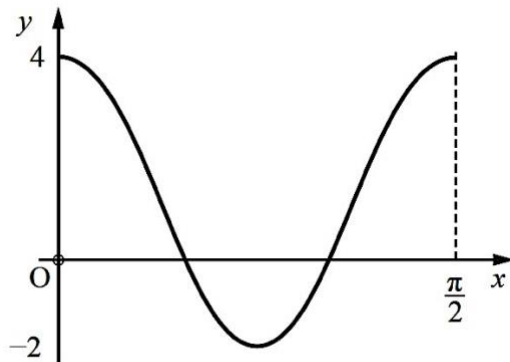
Which of the following diagrams could be the graph of $y = 2f(x) + 1$?





2015 Paper 1 Question 4, (3)

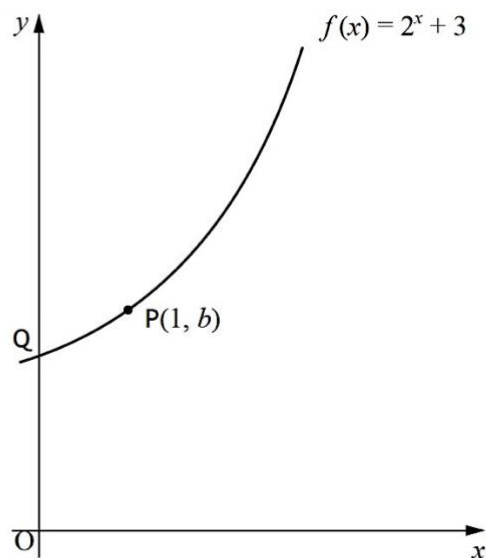
The diagram shows part of the graph of the function $y = p \cos qx + r$.



Write down the values of p , q and r .

2015 Paper 1 Question 13, (1) (1) (3) (2)

The graph with equation $y = f(x)$ passes through the point $P(1, b)$ and cuts the y -axis at Q as shown in the diagram.

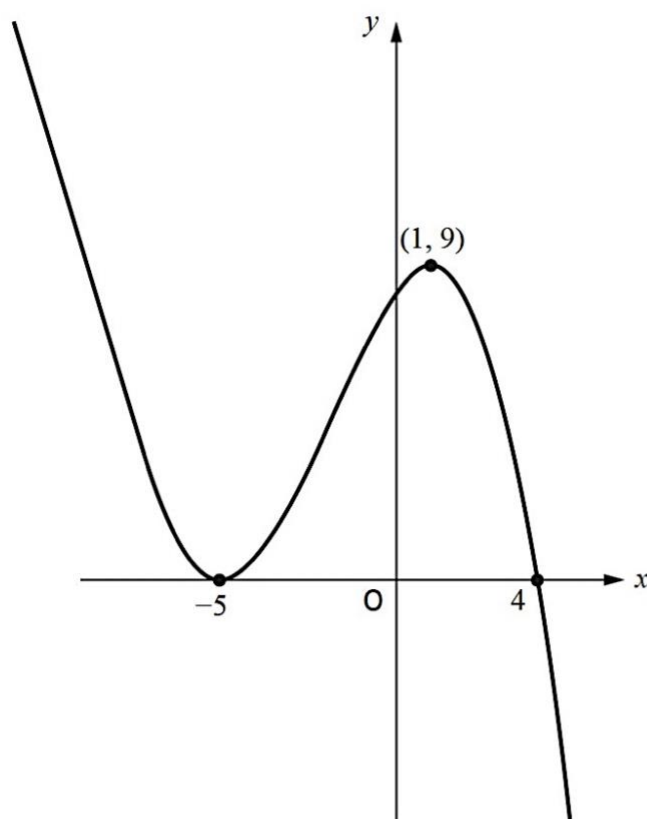


- (a) What is the value of b ?
- (b) (i) Copy the above diagram.
On the same diagram, sketch the graph with equation $y = f^{-1}(x)$.
- (ii) Write down the coordinates of the images of P and Q .
- (c) $R(3, 11)$ also lies on the graph with equation $y = f(x)$.
Find the coordinates of the image of R on the graph with equation $y = 4 - f(x + 1)$.



2016 Paper 1 Question 15, (3) (1)

The diagram below shows the graph with equation $y = f(x)$, where $f(x) = k(x-a)(x-b)^2$.



- (a) Find the values of a , b and k .
- (b) For the function $g(x) = f(x) - d$, where d is positive, determine the range of values of d for which $g(x)$ has exactly one real root.



2017 Paper 1 Question 15, (2)

A quadratic function, f , is defined on $\mathbb{R}$, the set of real numbers.

Diagram 1 shows part of the graph with equation $y = f(x)$.

The turning point is $(2, 3)$.

Diagram 2 shows part of the graph with equation $y = h(x)$.

The turning point is $(7, 6)$.

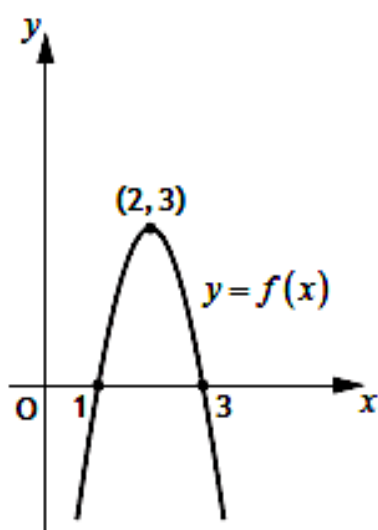


Diagram 1

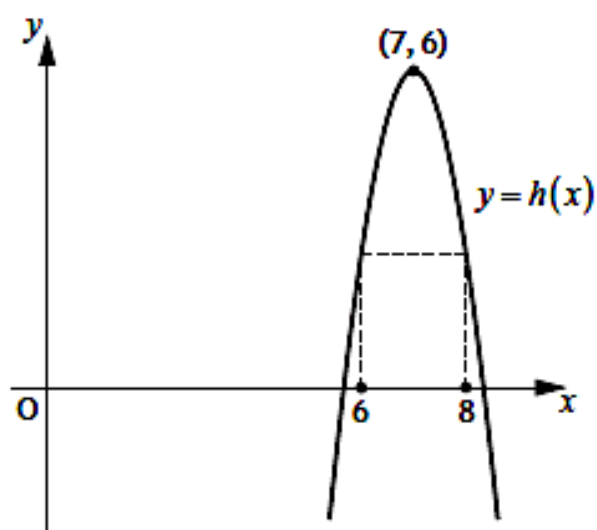


Diagram 2

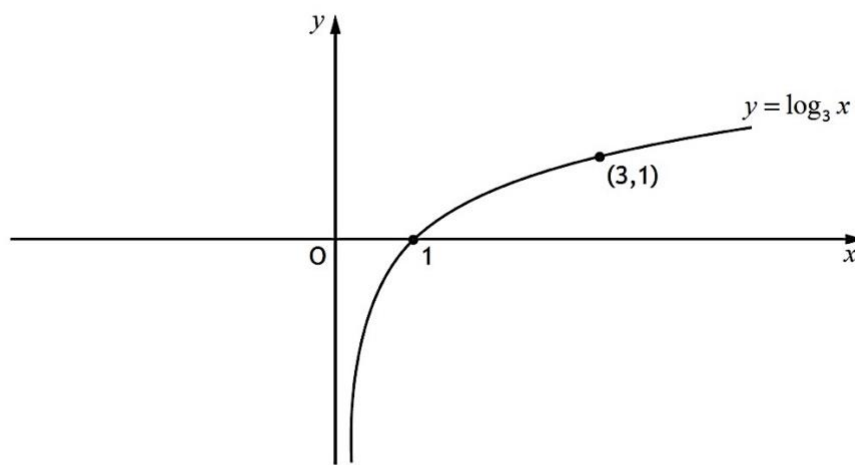
(a) Given that $h(x) = f(x + a) + b$.

Write down the values of a and b .



2018 Paper 1 Question 11, (2) (3)

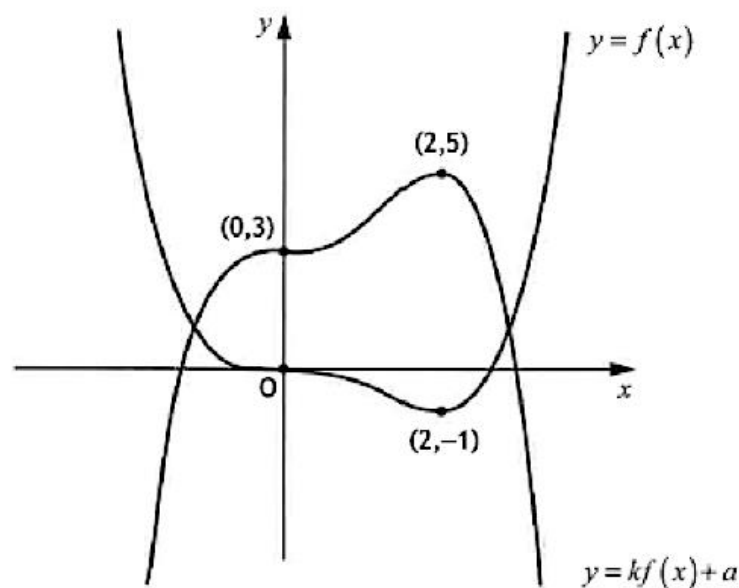
The diagram shows the curve with equation $y = \log_3 x$.



- (a) On the diagram in your answer booklet, sketch the curve with equation $y = 1 - \log_3 x$.
- (b) Determine the exact value of the x -coordinate of the point of intersection of the two curves.

2019 Paper 1 Question 10, (1) (1)

The diagram shows the graphs with equations $y = f(x)$ and $y = kf(x) + a$.



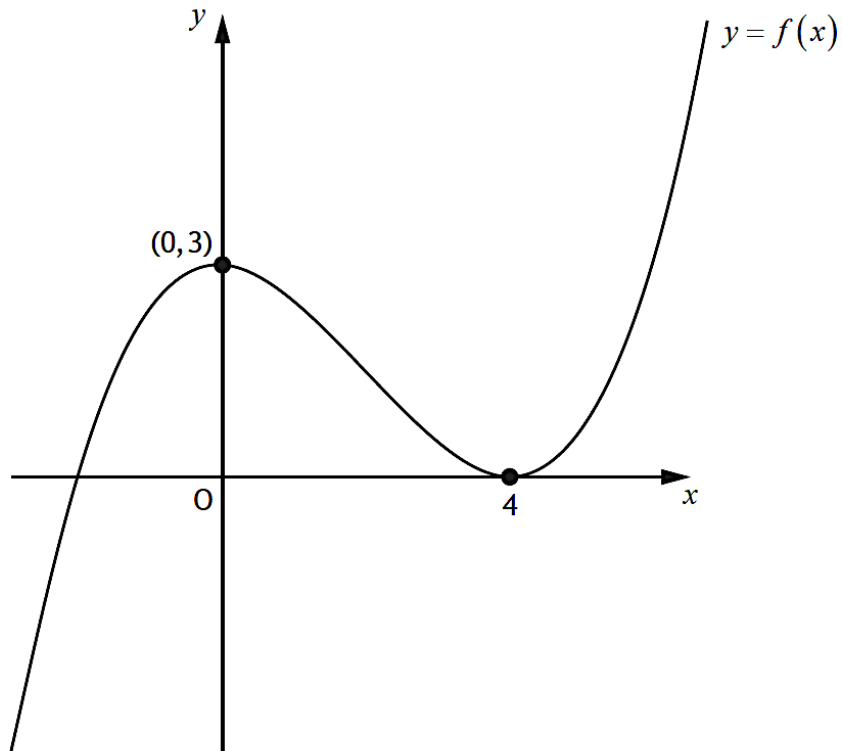
- (a) State the value of a .
- (b) Find the value of k .



2022 Paper 1 Question 10, (3) (1)

The diagram shows the graph of a cubic function with equation $y = f(x)$.

The curve has stationary points at $(0, 3)$ and $(4, 0)$.



- (a) Sketch the graph of $y = 2f(x) + 1$.

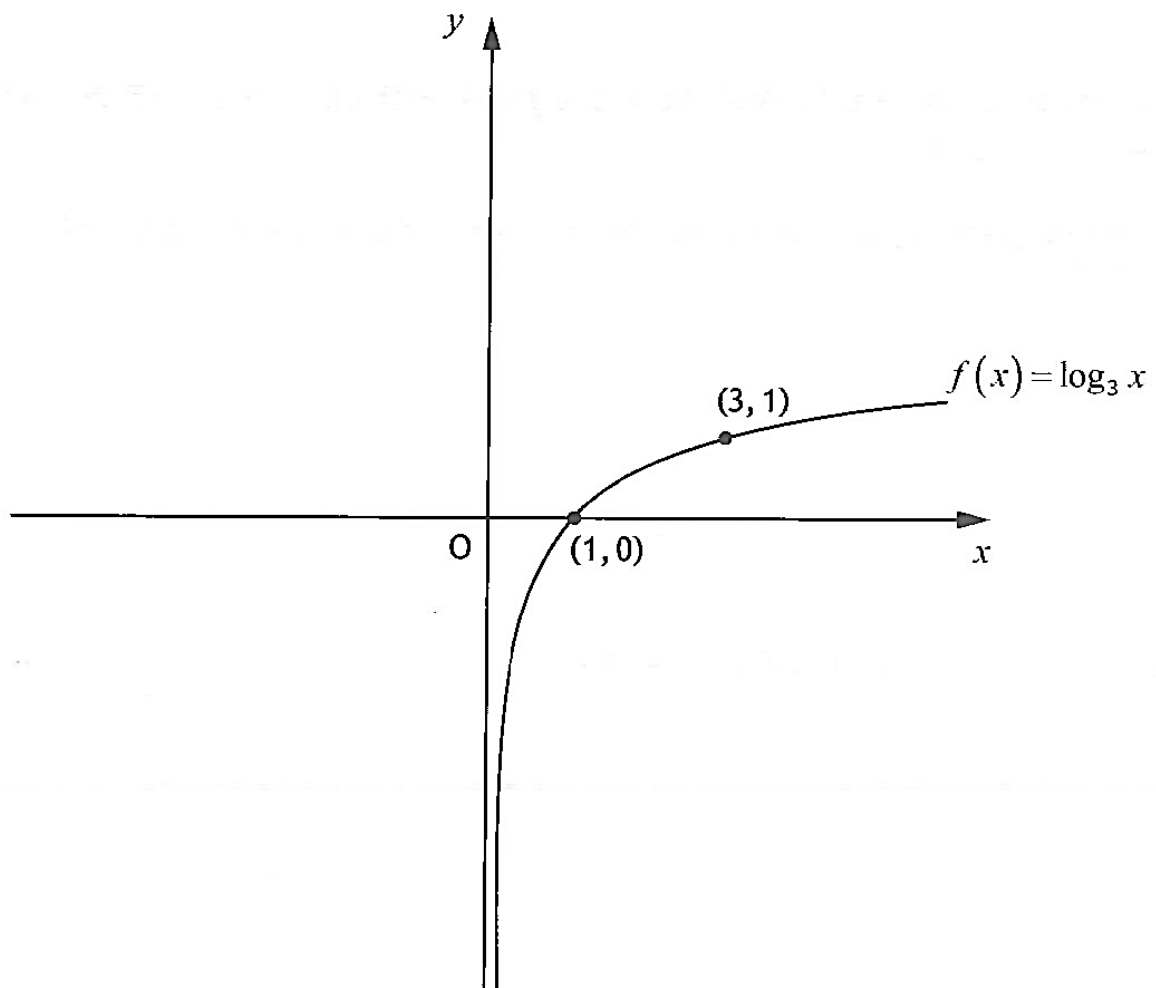
Use the diagram provided in the answer booklet.

- (b) State the coordinates of the stationary points on the graph of $y = f\left(\frac{1}{2}x\right)$.



2023 Paper 1 Question 9, (3)

The diagram shows the graph of the function $f(x) = \log_3 x$, where $x > 0$.



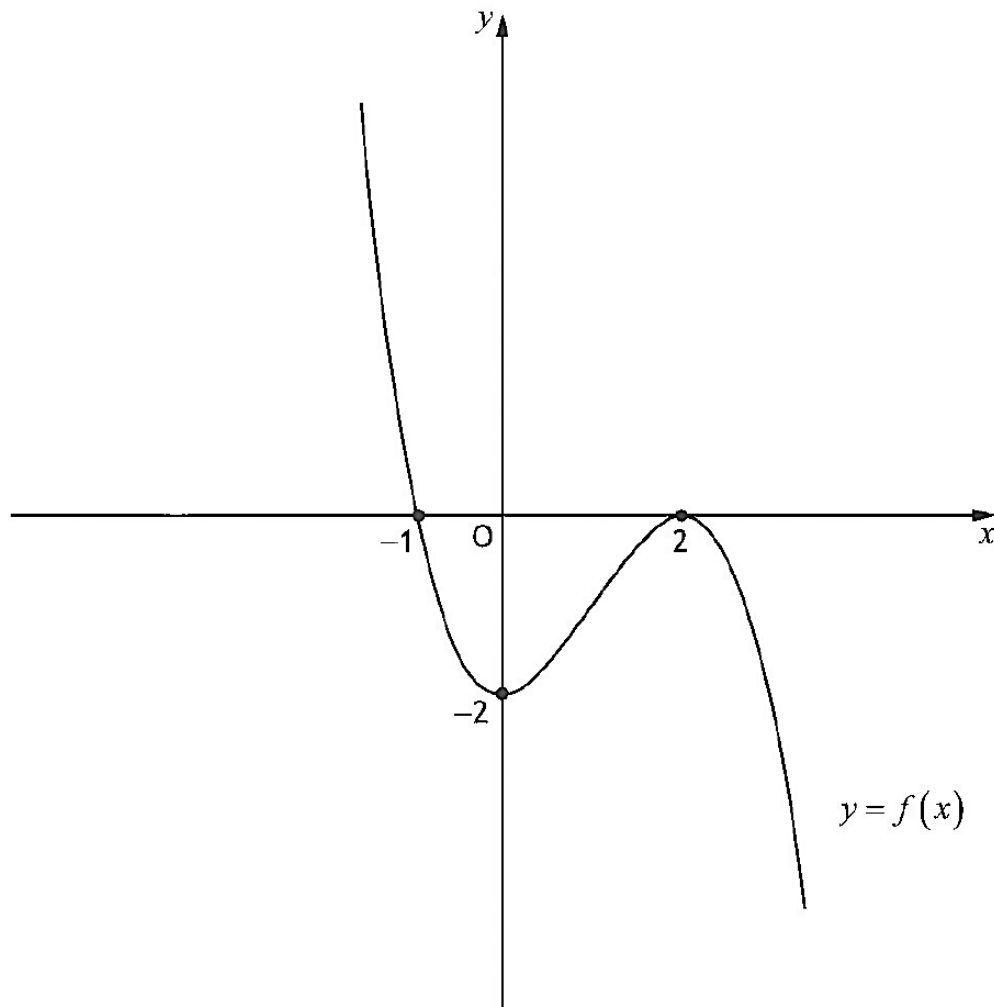
The inverse function, f^{-1} , exists.

On the diagram in your answer booklet, sketch the graph of $y = f^{-1}(x) - 1$.



2023 Paper 2 Question 4, (2)

The diagram shows the cubic graph of $y = f(x)$, with stationary points at $(2, 0)$ and $(0, -2)$.



On the diagram in your answer booklet, sketch the graph of $y = 2f(-x)$.

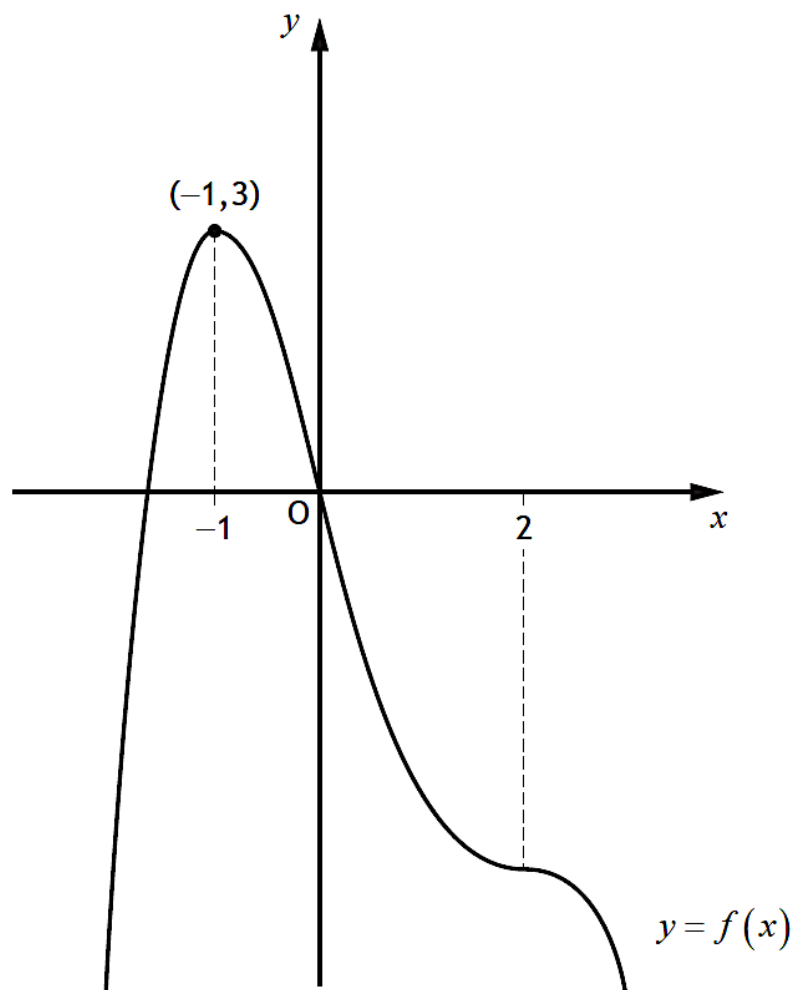


2024 Paper 2 Question 4, (2) (3)

The diagram shows the graph of a quartic function $y = f(x)$.

A maximum turning point occurs at $(-1, 3)$.

The graph of $y = f(x)$ also has a point of inflection at $x = 2$.

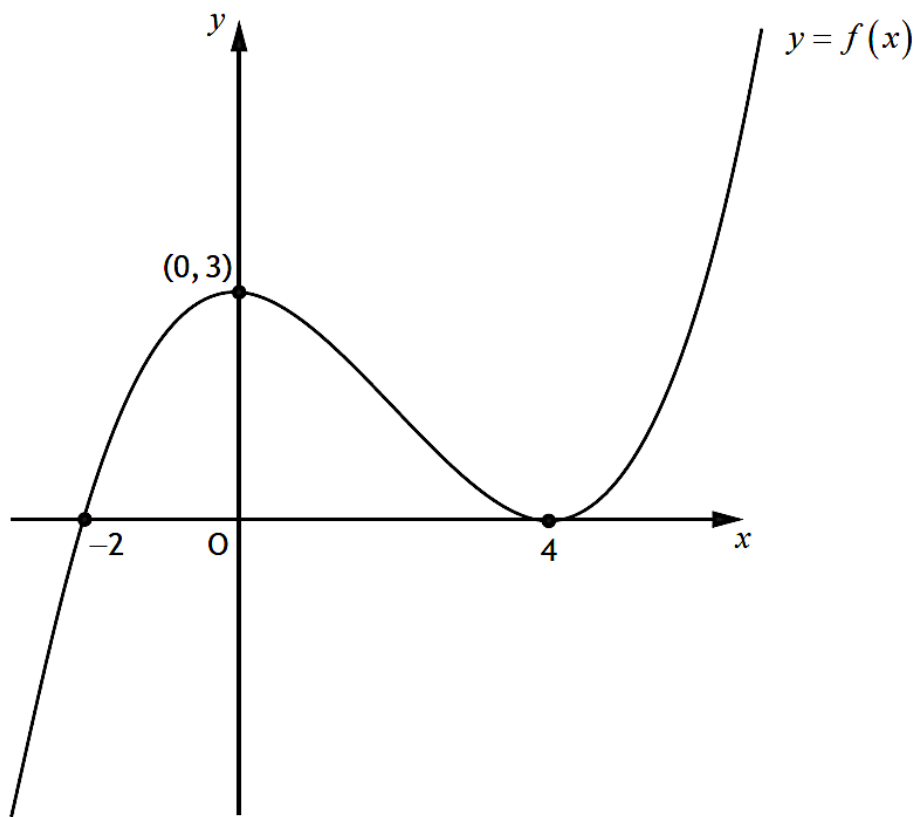


- (a) Determine the coordinates of the maximum turning point on the graph of $y = f(x - 4) + 2$.
- (b) On the diagram in your answer booklet, sketch the graph of $y = f'(x)$.



2025 Paper 1 Question 5, (2)

The diagram shows the graph of $y = f(x)$, with stationary points at $(0, 3)$ and $(4, 0)$.



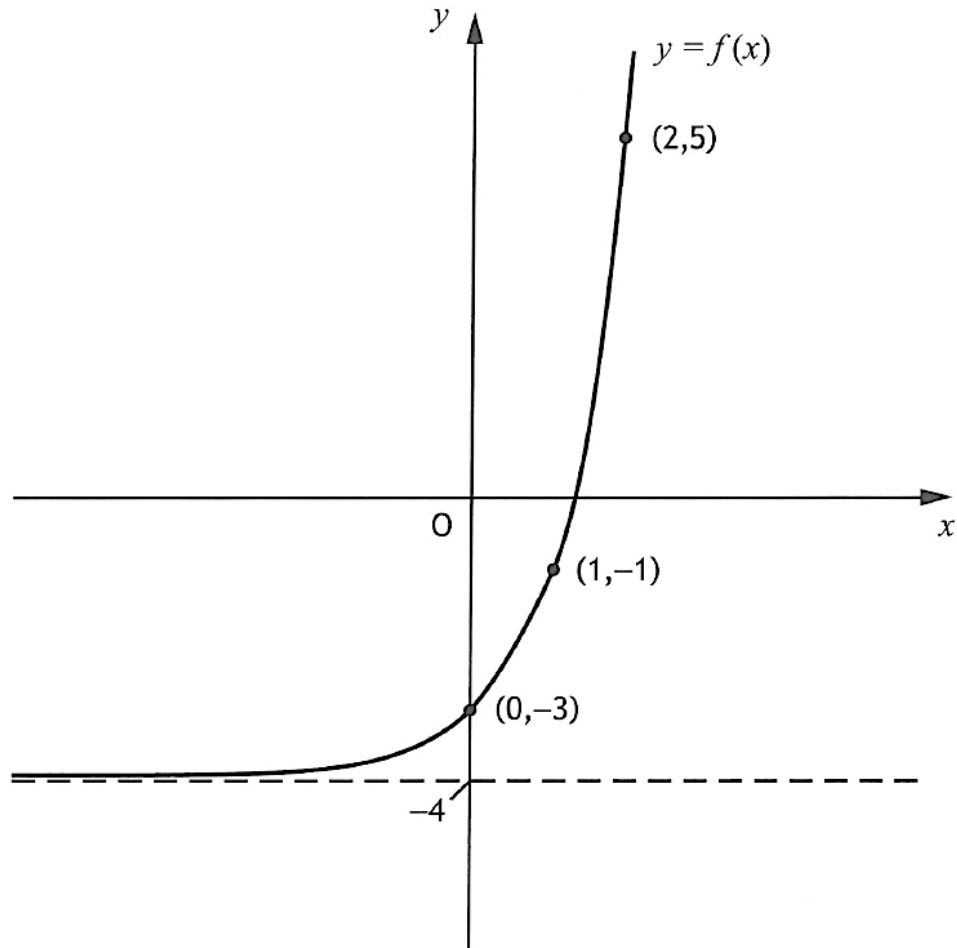
On the diagram in your answer booklet, sketch the graph of $y = f(-x) + 3$.



2026 Paper 1 Question 12, (2) (2) (1)

An exponential function, f , is defined for $x \in \mathbb{R}$.

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



The inverse function, $f^{-1}(x)$, exists.

(a) On the diagram in your answer booklet, sketch the graph of the inverse function.

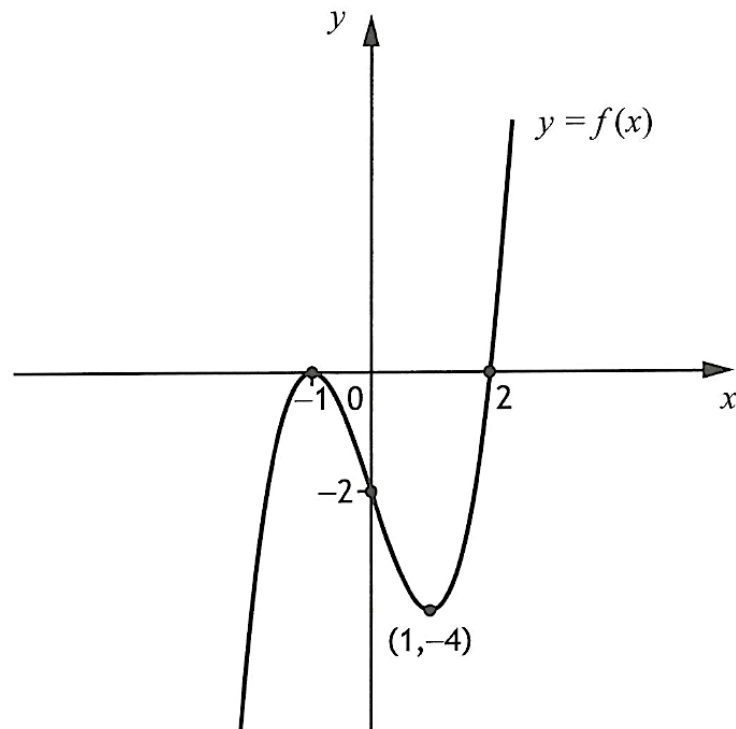
The inverse function is of the form $f^{-1}(x) = \log_a(x + b)$.

- (b) (i) Determine the values of a and b .
(ii) State the domain of the inverse function, $f^{-1}(x)$.



2026 Paper 2 Question 6, (3)

The diagram shows the graph of a cubic function $y = f(x)$ with stationary points at $(-1, 0)$ and $(1, -4)$.



On the diagram in your answer booklet, sketch the graph of $y = -f(x) + 1$.