0606 Additional Mathematics Paper 1 - Functions

Topical questions | 10 questions

1. Question | 0606 Feb-March 2025 P1 V2 Q5

5 **(a)** Write $2x^2 - 2x + 3$ in the form $a(x+b)^2 + c$, where a, b and c are constants. [3]

It is given that $\mathrm{f}(x) = 2x^2 - 2x + 3$, for $x \leqslant p$.

(b) Write down the greatest value of p for which f has an inverse. [1]

(c) Using this value of p, write down the range of f. [1]

(d) Using this value of p, find an expression for f^{-1}. [3]

2. Question | 0606 May-June 2025 P1 V2 Q9

9 It is given that $\mathrm{f}(x) = 2\ln(3x-4)$, for $x > a$, and that f^{-1} exists.

(a) Find the least possible value of a. [1]

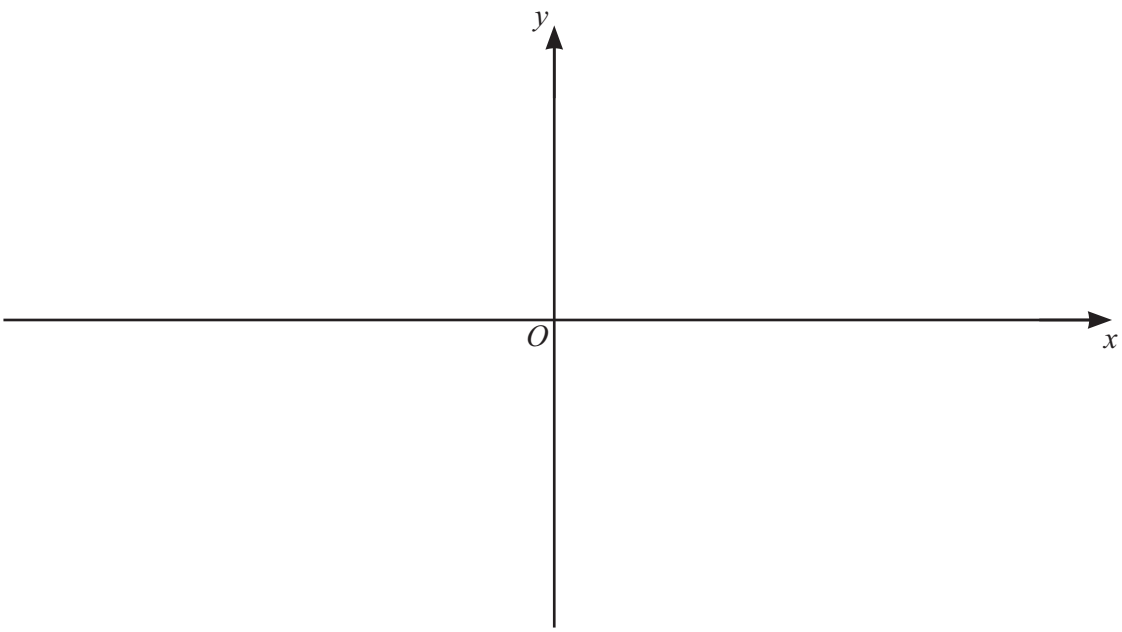
(b) For your value of a, find the range of f. [1]

(c) For your value of a, find an expression for $\mathrm{f}^{-1}(x)$. [2]

(d) It is given that the equation $\mathrm{f}(x) = \mathrm{f}^{-1}(x)$ has two roots.

For your value of a, sketch the graphs of $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$ on the axes.

Label each graph.
State the intercepts of each graph with the axes.
State the equations of any asymptotes. [4]



3. Question part 1/2 | 0606 May-June 2025 P1 V3 Q9

9 The function f is defined by $\mathrm{f}(x) = -2x^2 + 9x - 10$ for $0 \leqslant x \leqslant 3$.

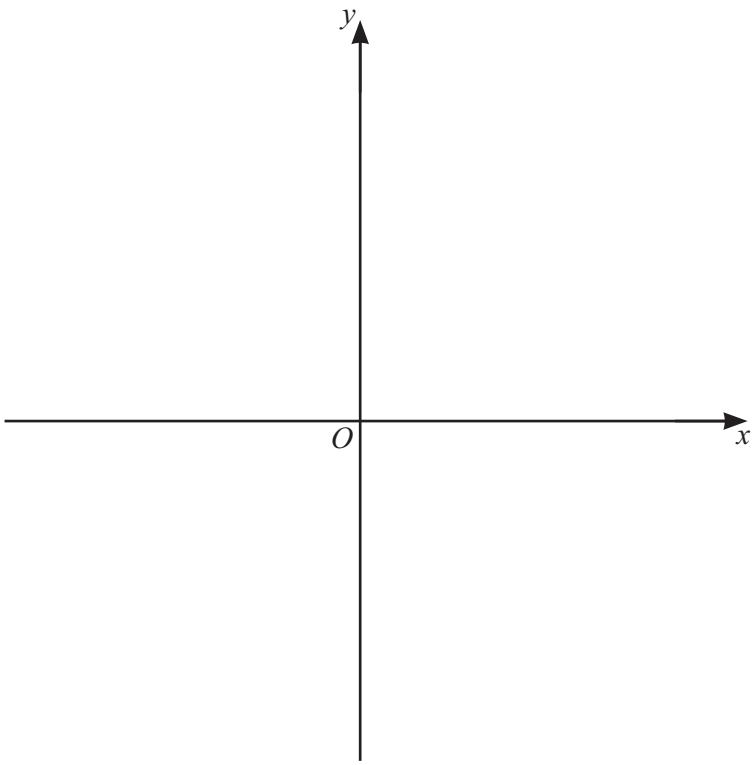
(a) (i) Write $\mathrm{f}(x)$ in the form $a + b(x + c)^2$ where a, b and c are constants. [3]

(ii) Hence determine whether or not f^{-1} exists. [2]

3. Question part 2/2 | 0606 May-June 2025 P1 V3 Q9

(b) The function g is defined by $g(x) = 3\ln(5-2x)$ for $0 \leqslant x < 2.5$.

(i) On the axes, sketch the graph of $y = g(x)$.
State the exact values of the intercepts with the coordinate axes and the equation of any asymptote. [3]

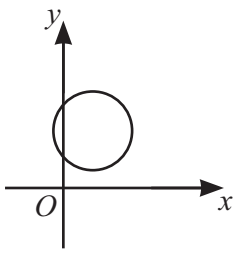


(ii) Find an expression for $g^{-1}(x)$. [2]

(iii) Find the domain and range of g^{-1}.
Give each of your answers in exact form. [2]

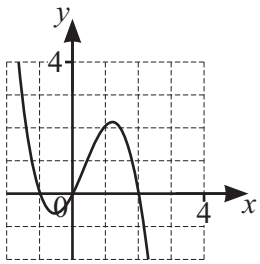
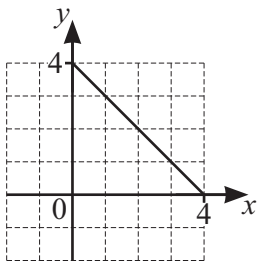
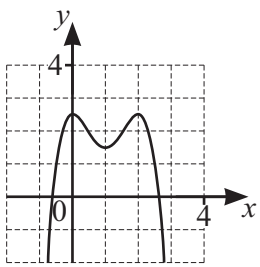
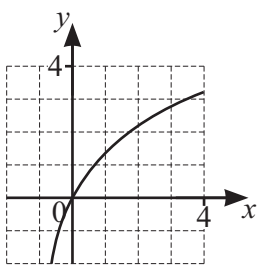
4. Question part 1/2 | 0606 Oct-Nov 2025 P1 V1 Q4

4 (a)



Explain why this graph does **not** represent a function. [1]

(b) The table shows the graphs of four different functions.

	is one-one	is many-one	is its own inverse
			
			
			
			

Tick (✓) each correct box in the table.
There may be more than one tick in a row or a column. [4]

4. Question part 2/2 | 0606 Oct-Nov 2025 P1 V1 Q4

(c) Functions f and g are defined as follows.

f: $x \mapsto \sin x$ for $30° \leqslant x \leqslant a°$

g: $x \mapsto \sqrt{x - \frac{1}{2}}$ for $x \geqslant \frac{1}{2}$

It is given that the function gf exists.

(i) Find the value of a so that the domain of gf is as large as possible.

You may use the information that $\sin 30° = \frac{1}{2}$. [2]

(ii) For the domain found in **part (i)**, find the range of the function gf. [2]

(iii) Determine whether the function g^2 exists. [1]

5. Question part 1/2 | 0606 Oct-Nov 2025 P1 V2 Q4

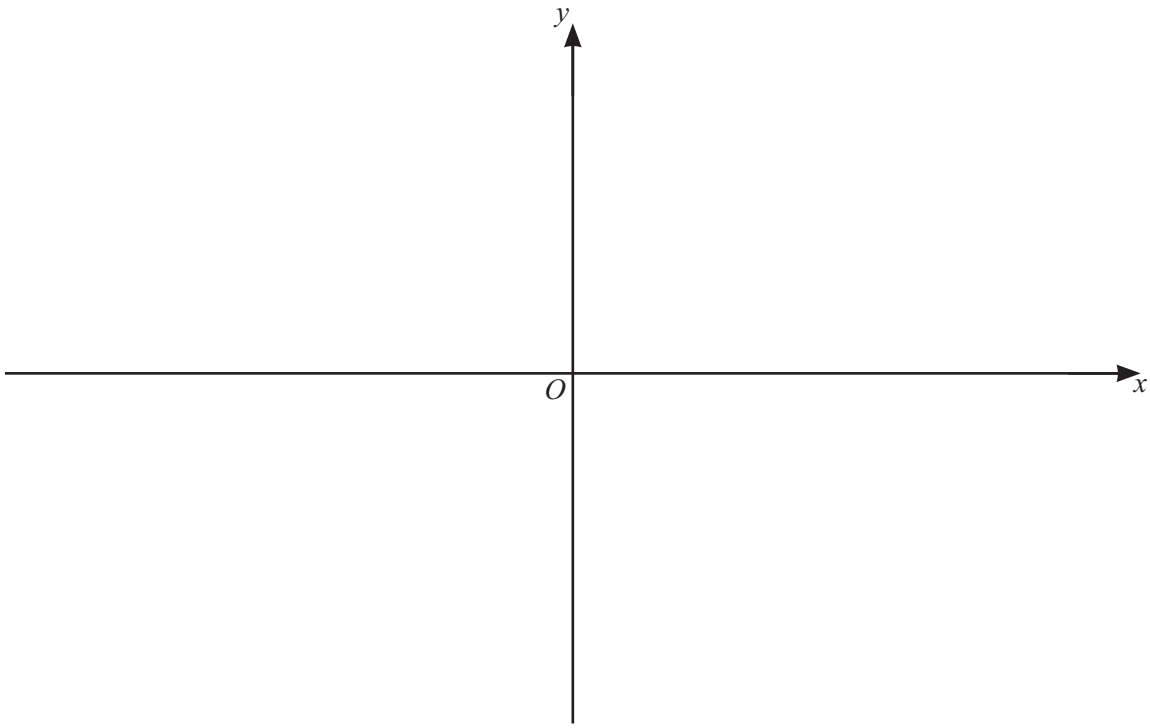
4 **(a)** Show that $2x^2 + 5x + 3$ can be written in the form $2(x + a)^2 + b$, where a and b are constants to be found. [2]

(b) Hence write down the coordinates of the stationary point on the curve $y = 2x^2 + 5x + 3$. [2]

A function f is such that $\text{f}(x) = 2x^2 + 5x + 3$, for $x \geqslant p$, where p is a constant.
It is given that f^{-1} exists.

(c) **(i)** Write down the least possible value of p. [1]

(ii) Using your value of p, sketch the graphs of $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$.
Label each graph.
State the intercepts of each of the graphs with the axes. [5]



6. Question | 0606 Specimen 2025 P1 Q1

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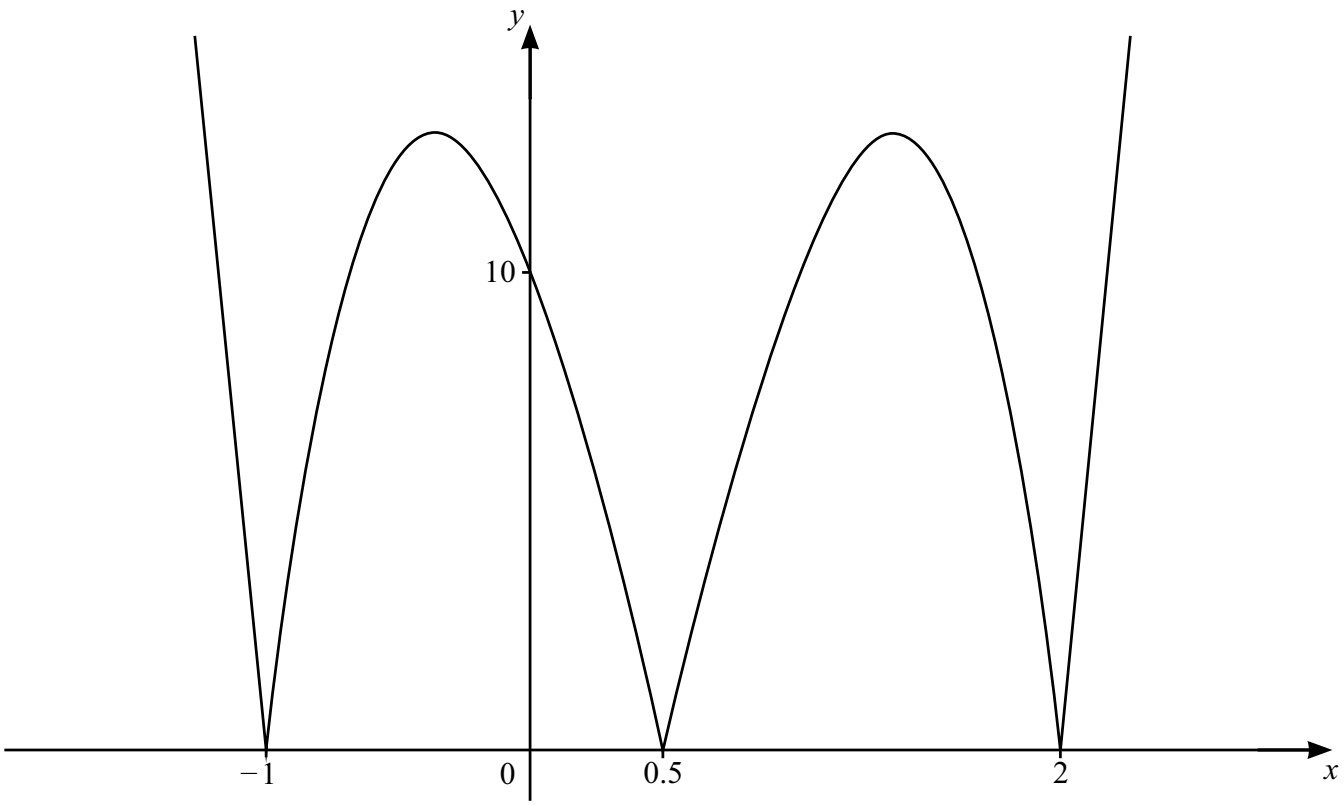


The diagram shows the graph of $y = |f(x)|$, where $f(x)$ is a cubic function.

Find the possible expressions for $f(x)$ in factorised form. [3]

7. Question part 1/2 | 0606 Specimen 2025 P1 Q6

6 **(a)** $f(x) = 3e^{2x} + 1 \quad \text{for} \quad x \in \mathbb{R}$

$g(x) = x + 1 \quad \text{for} \quad x \in \mathbb{R}$

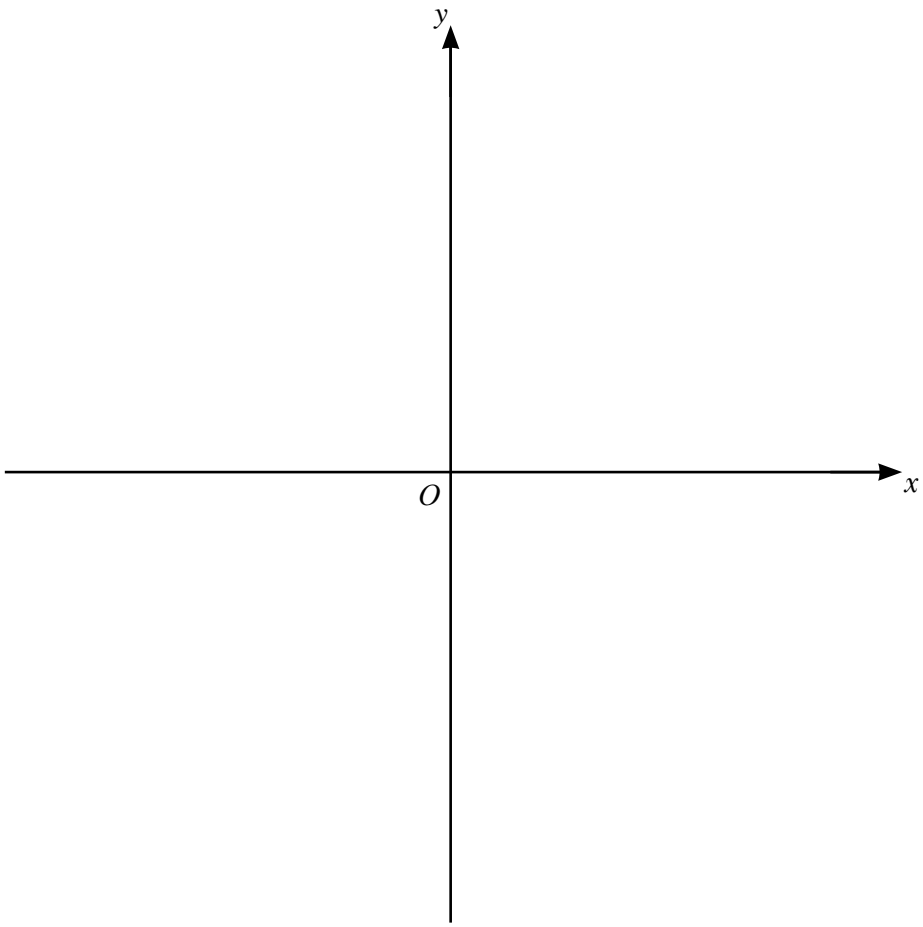
(i) Write down the range of f and the range of g. [2]

(ii) Find $g^2(0)$. [1]

(iii) Hence find $fg^2(0)$. [2]

(iv) On the axes below, sketch the graphs of $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$.

State the intercepts with the coordinate axes and the equations of any asymptotes. [4]



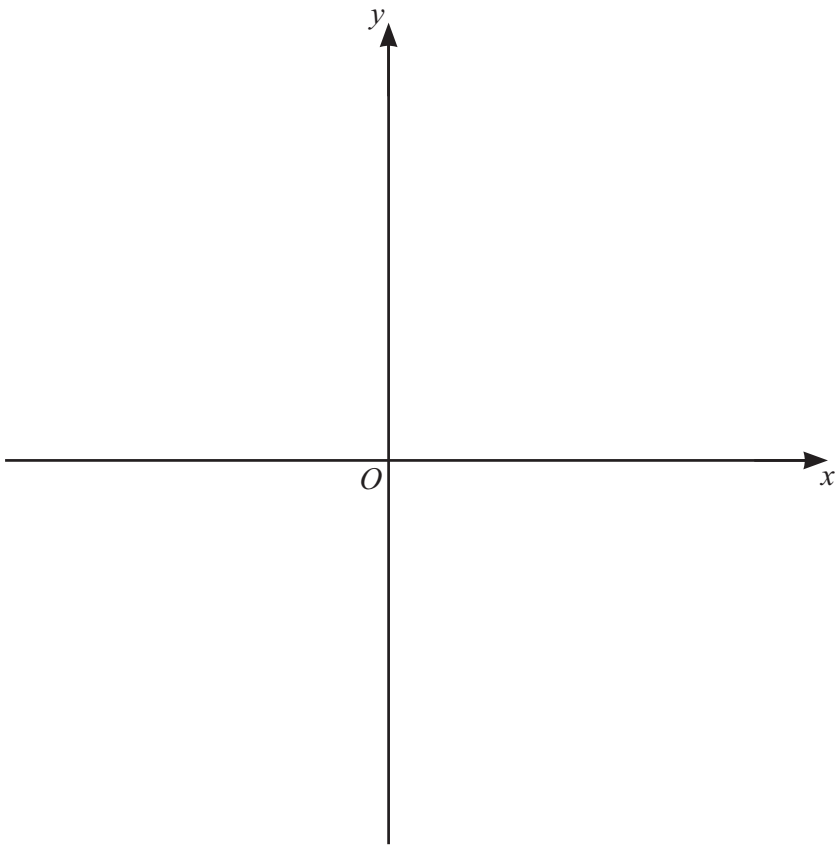
(b) It is given that $\mathrm{h}(x) = a + \frac{b}{x^2}$, where a and b are constants.

(i) Explain why $-2 \leqslant x \leqslant 2$ is not a suitable domain for $\mathrm{h}(x)$. [1]

(ii) Given that $\mathrm{h}(1) = 4$ and $\mathrm{h}'(1) = 16$, find the values of a and b. [2]

8. Question | 0606 Feb-March 2026 P1 V2 Q2

2 **(a)** On the axes, sketch the graph of $y = \left|x^2 - 2x - 3\right|$.
State the intercepts with the coordinate axes. [4]



(b) The function g is defined by $\mathrm{g}(x) = 4\mathrm{e}^{x-2} - 1$ for all real x.

Find an expression for $\mathrm{g}^{-1}(x)$. [2]

9. Question part 1/2 | 0606 May-June 2026 P1 V1 Q6

6 The function f is such that $\mathrm{f}(x) = 3x^2 + 8x$ for $x \geqslant k$, where k is a constant.
It is given that f^{-1} exists.
k has the least possible value for which f^{-1} exists.

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

(b) Find the range of f. [2]

(c) Find an expression for f^{-1}. [3]

9. Question part 2/2 | 0606 May-June 2026 P1 V1 Q6

(d) The function g is such that $g(x) = 3^x$ for $x > -6$.

(i) Write down the domain of gf. [1]

(ii) Solve the equation $gf(x) = 27$. [4]

10. Question part 1/2 | 0606 May-June 2026 P1 V3 Q8

8 A function f is defined by $\mathrm{f}(x) = \mathrm{e}^{2x+1}$ for $x \in \mathbb{R}$.

(a) State the range of f^{-1}. [1]

(b) Find the domain of f^{-1}. [1]

(c) Find an expression for $\mathrm{f}^{-1}(x)$. [2]

(d) On the axes, sketch the graph of $y = \mathrm{f}(x)$ and hence sketch the graph of $y = \mathrm{f}^{-1}(x)$.
State the exact coordinates of any intercepts with the axes. [4]

