4037 Additional Mathematics Paper 1 - Functions

Topical questions | 5 questions

1. Question | 4037 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]

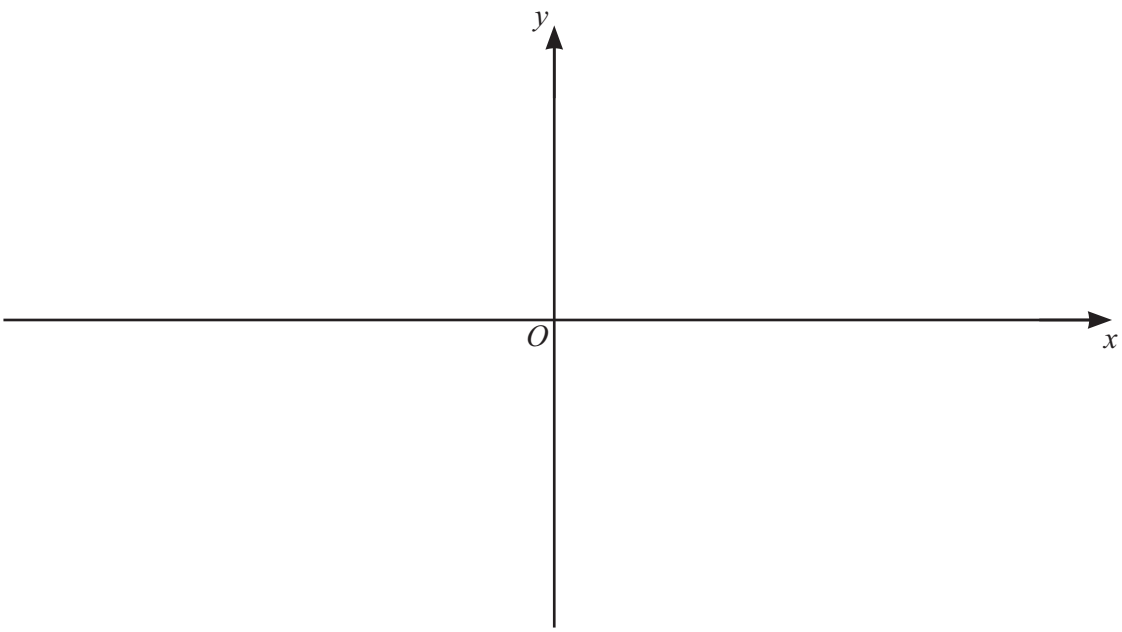
(b) For your value of a, find the range of f. [1]

(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]



2. Question part 1/2 | 4037 Oct-Nov 2025 P1 V2 Q4

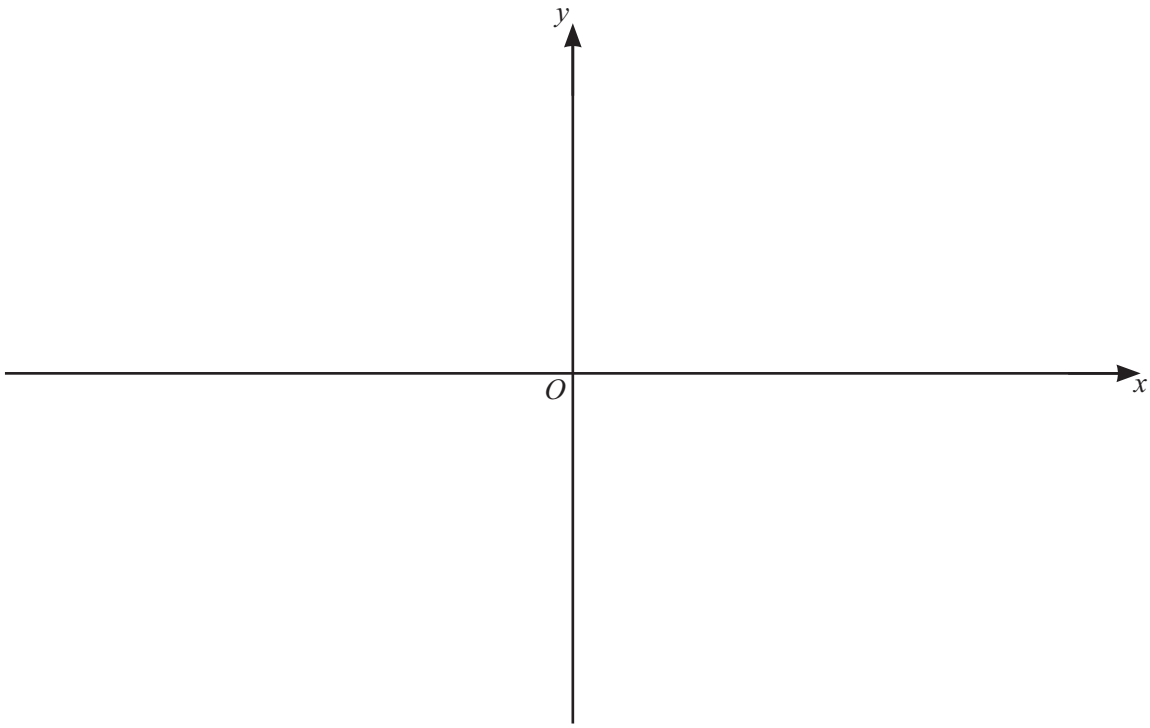
4 **(a)** Show that $2x^2 + 5x + 3$ can be written in the form $2(x + a)^2 + b$, where a and b are constants to be found. [2]

(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.

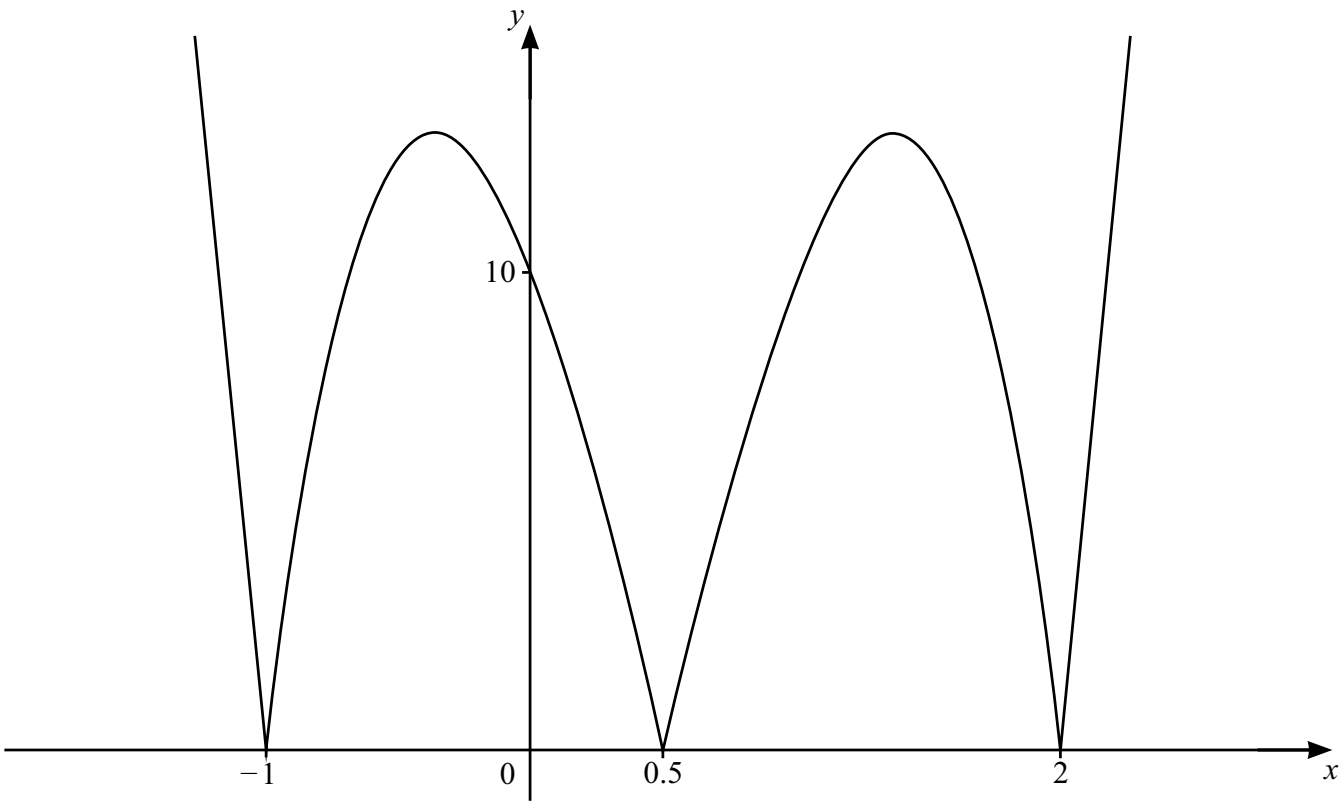
(c) **(i)** Write down the least possible value of p. [1]

(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]



3. Question | 4037 Specimen 2025 P1 Q1

1



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]

4. Question part 1/2 | 4037 Specimen 2025 P1 Q6

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

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

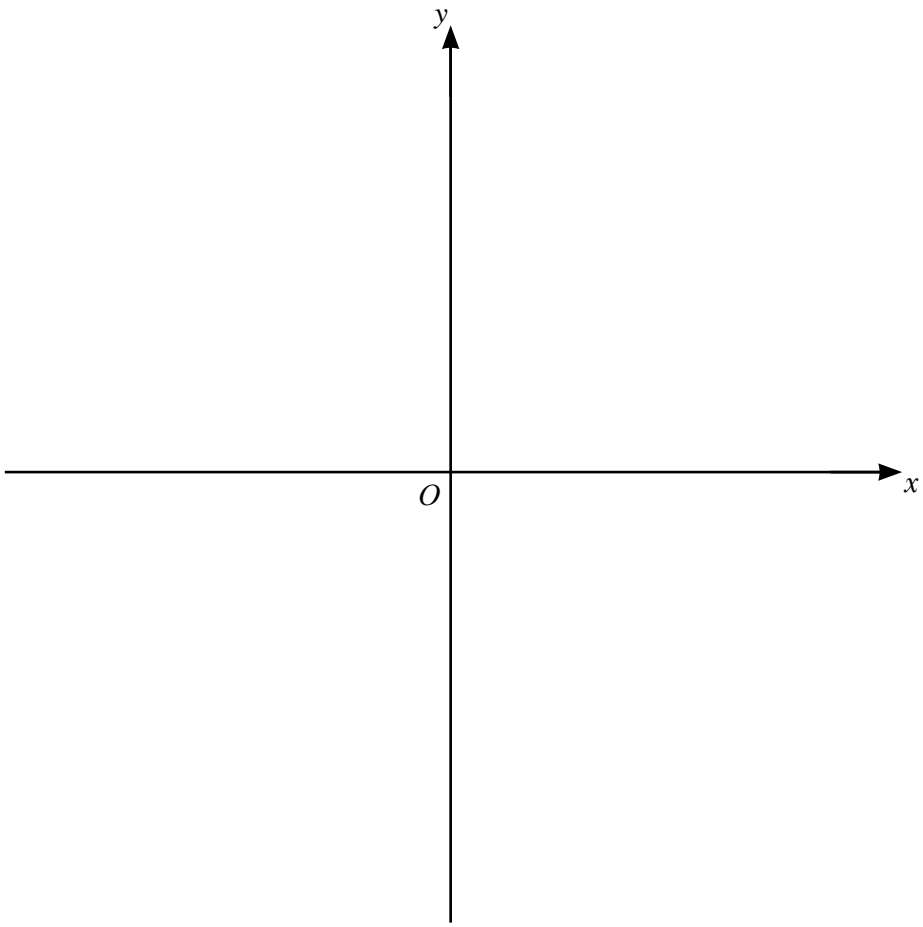
(i) Write down the range of f and the range of g. [2]

(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]

5. Question part 1/2 | 4037 May-June 2026 P1 V1 Q6

6 The function f is such that $f(x) = 3x^2 + 8x$ 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]

5. Question part 2/2 | 4037 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]