# 4037 Additional Mathematics Paper 2 - Functions

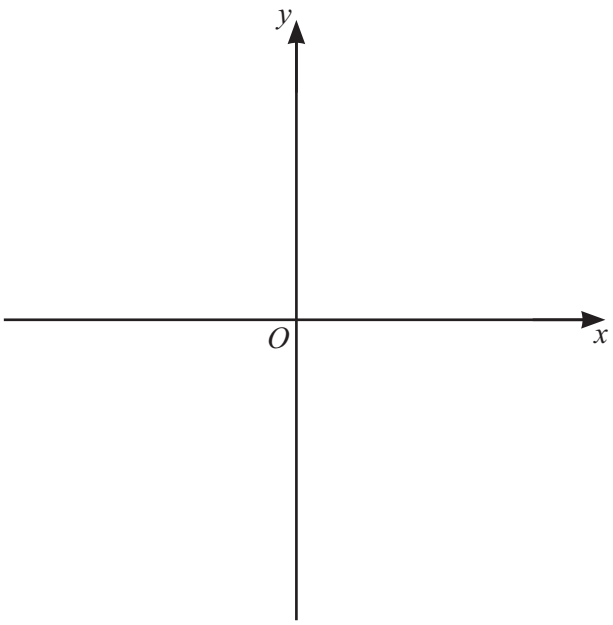
Topical questions | 7 questions

1. Question part 1/2 | 4037 May-June 2025 P2 V1 Q7

**7** **(a)** The function f is defined by $\mathrm{f}(x) = 2\mathrm{e}^{-x} + 3$ for $x \in \mathbb{R}$.

On the axes, sketch the graph of $y = \mathrm{f}(x)$ and hence, on the same axes, sketch the graph of $y = \mathrm{f}^{-1}(x)$.
Show clearly

- the positions of any points where your graphs meet the coordinate axes
- the positions of any asymptotes. [4]



# 4037 Additional Mathematics Paper 2 - Functions

Topical questions | 7 questions

1. Question part 2/2 | 4037 May-June 2025 P2 V1 Q7

**(b)** The function g is defined by $\mathrm{g}(x) = 2 - \dfrac{3}{\mathrm{e}^x + 2}$ for $x \geqslant 0$.

Given that $\mathrm{g}^{-1}$ exists, find an expression for $\mathrm{g}^{-1}(x)$ and state its domain. [4]

2. Question | 4037 May-June 2025 P2 V2 Q3

**3** Functions f and g are such that

$$\mathrm{f}(x) = \frac{3x}{x+4} \quad \text{for } x > 0$$

$$\mathrm{g}(x) = \sqrt{x+2} \quad \text{for } x > -2\,.$$

Solve the equation $\mathrm{fg}(x) = 1$. [4]

3. Question | 4037 Oct-Nov 2025 P2 V2 Q9

**9** It is given that $f(x) = \ln(2x+5)$ for $x > a$, where $a$ is a constant.

**(a)** Write down the least possible value of $a$. [1]

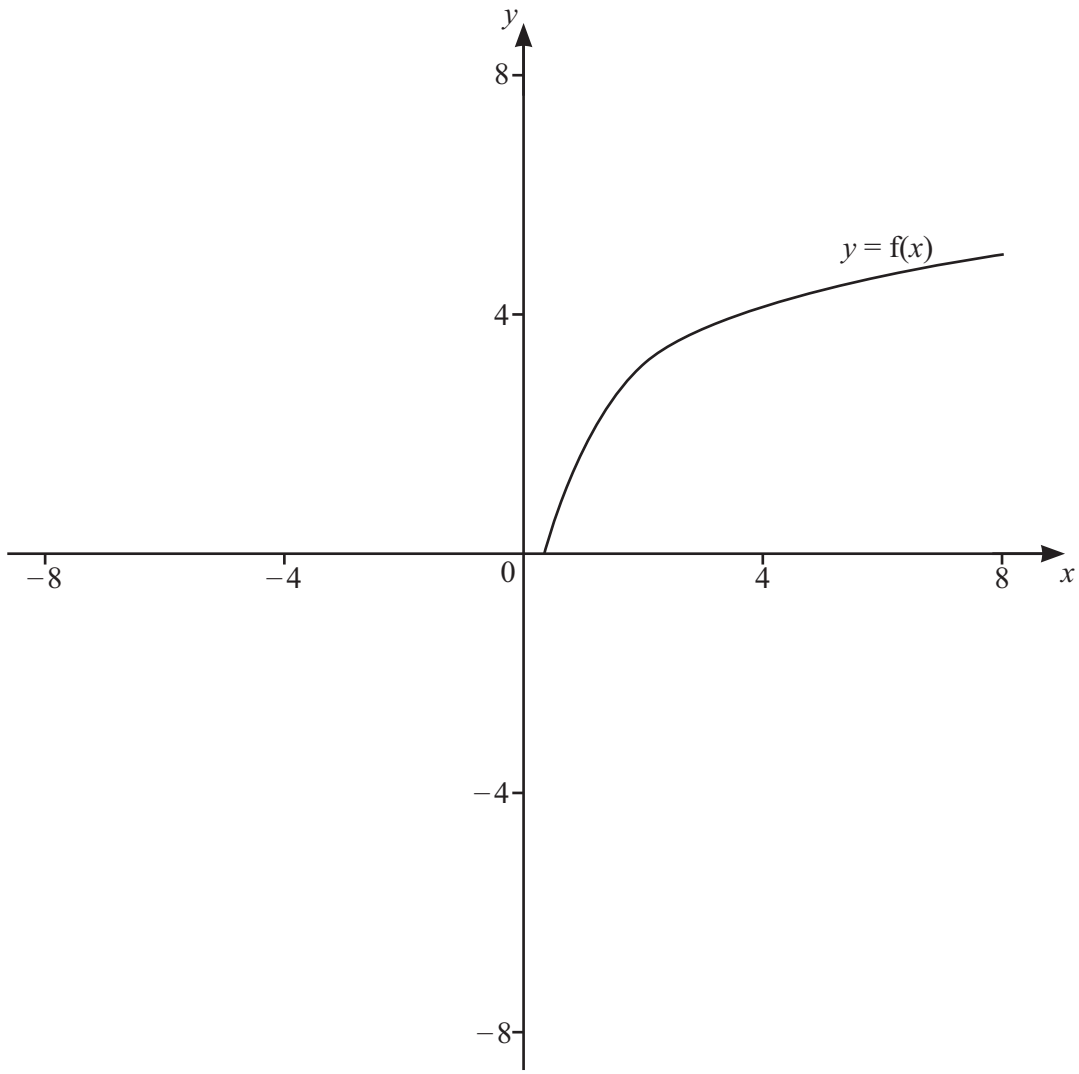
**(b)** Using your value of $a$, write down the range of f. [1]

It is also given that $g(x) = x^2 + 1$ for $x \in \mathbb{R}$.

**(c)** Using your value of $a$, solve the equation $fg(x) = 4$.
Give your answers in exact form. [3]

4. Question part 1/2 | 4037 Oct-Nov 2025 P2 V3 Q2

**2 (a) (i)**




The diagram shows the graph of $y = \mathrm{f}(x)$.

On the same diagram sketch the graph of $y = \mathrm{f}^{-1}(x)$. [1]

**(ii)** Describe the relationship between the graph of $\mathrm{f}(x)$ and the graph of $\mathrm{f}^{-1}(x)$. [1]

4. Question part 2/2 | 4037 Oct-Nov 2025 P2 V3 Q2

**(b)** A function g is defined by $\mathrm{g}(x) = \mathrm{e}^{\sqrt{x-2}}$ for $x \geqslant 2$ .

**(i)** Find an expression for $\mathrm{g}^{-1}(x)$. [3]

**(ii)** Write down the range of $\mathrm{g}^{-1}$. [1]

**(iii)** A function h is defined by $\mathrm{h}(x) = \frac{1}{x^2} + 2$ for $x > 0$.

Find an expression for $\mathrm{gh}(x)$ in its simplest form. [2]

5. Question part 1/2 | 4037 Specimen 2025 P2 V2 Q8

**8** $f(x) = x^2 + 2x + 5 \quad \text{for } x \geqslant 0$

$g(x) = \dfrac{5x}{x+2} \quad \text{for } x \geqslant 0$

**(a) (i)** Explain why the function $f^{-1}$ can be formed. [2]

**(ii)** Find and simplify an expression for $f^{-1}(x)$. [4]

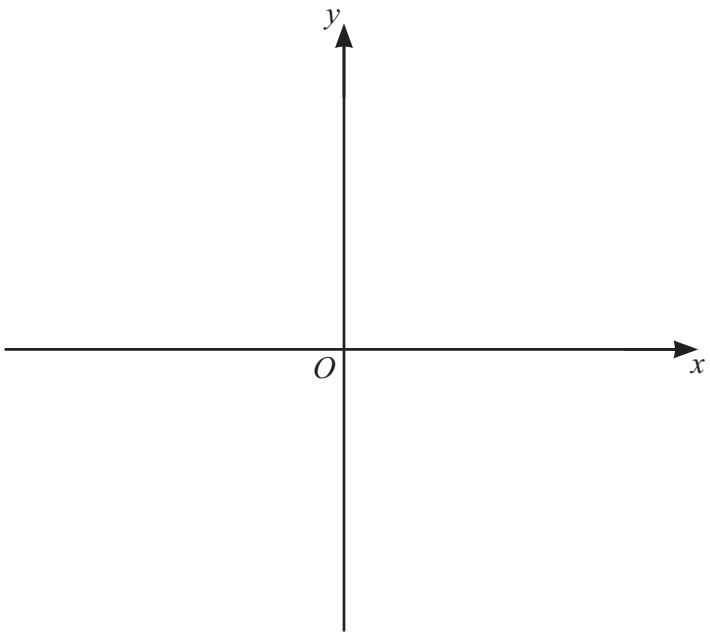
5. Question part 2/2 | 4037 Specimen 2025 P2 V2 Q8

**(b) (i)** Explain why the function gf can be formed. [2]

**(ii)** Solve the equation $\text{gf}(x) = 4$. [4]

6. Question | 4037 May-June 2026 P2 V2 Q4

**4** **(a)** On the axes, sketch the graph of $y = |x^2 - 5|$.
State the intercepts with the coordinate axes. [3]




**(b)** It is given that $f(x) = ax + b$ where $a$ and $b$ are non-zero integers.
The solutions of the equation $|f(x)| = 4$ are $x = 2.5$ and $x = -1.5$.

Find the possible expressions for $f(x)$. [4]

7. Question part 1/2 | 4037 May-June 2026 P2 V2 Q8

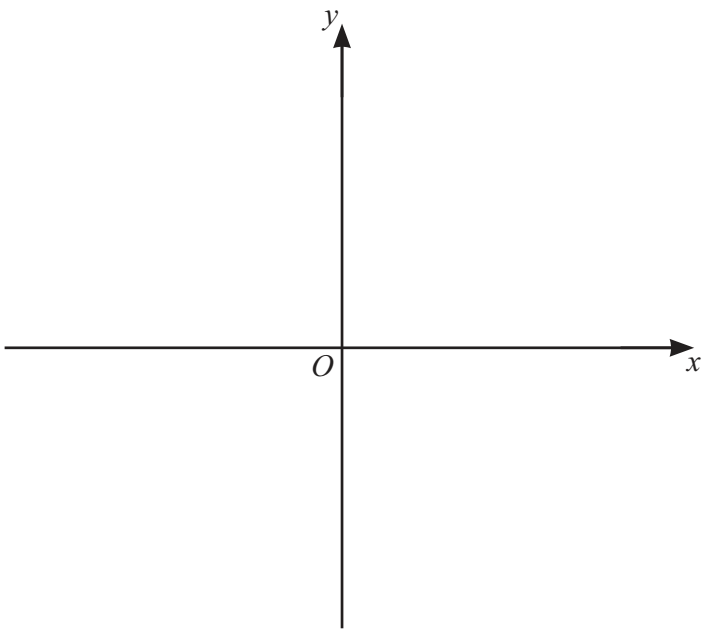
**8** The function f is defined, for $x \geqslant -1$, by $\mathrm{f}(x) = 1 + 2^x$.

**(a)** Find the range of f. [1]

**(b)** **(i)** Write down the domain of $\mathrm{f}^{-1}$. [1]

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

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



7. Question part 2/2 | 4037 May-June 2026 P2 V2 Q8

**(c)** The function g is defined, for $x \geqslant -1$, by $g(x) = x(x+k)$ where $k$ is a constant.

**(i)** Explain why gf exists. [1]

**(ii)** Find an expression for $gf(x)$. [1]

**(iii)** It is given that $gf(3) = 126$.

Find the value of $k$. [2]