Name:

Mathematics IB HL Test 1 resit

October 13, 2021

45 minutes

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Calculators are **not allowed** for this examination paper.
- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
- The maximum mark for this examination paper is [**36 marks**].
- Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to **show all working**.
- Write your solutions in the space provided.

1. [Maximum mark: 4]

Solve the inequality:

$$|3x - 1| \leqslant |x + 2|$$

2. [Maximum mark: 6]

Let $f(x) = \dfrac{x^2 + x - 2}{x - 2}$.

a) Sketch the graph of $y = f(x)$. Clearly indicate any asymptotes and axis intercepts.

b) On a separate diagram sketch the graph of $y = f(|x|)$. Clearly indicate any asymptotes and axis intercepts.

3. [Maximum mark: 6]

Let $f(x) = \frac{1}{2}x^2 - x - 4$.

a) Find the x-intercepts, the y-intercept and the coordinates of the vertex of the graph of $f(x)$.

Let $g(x) = f(x - 1)$

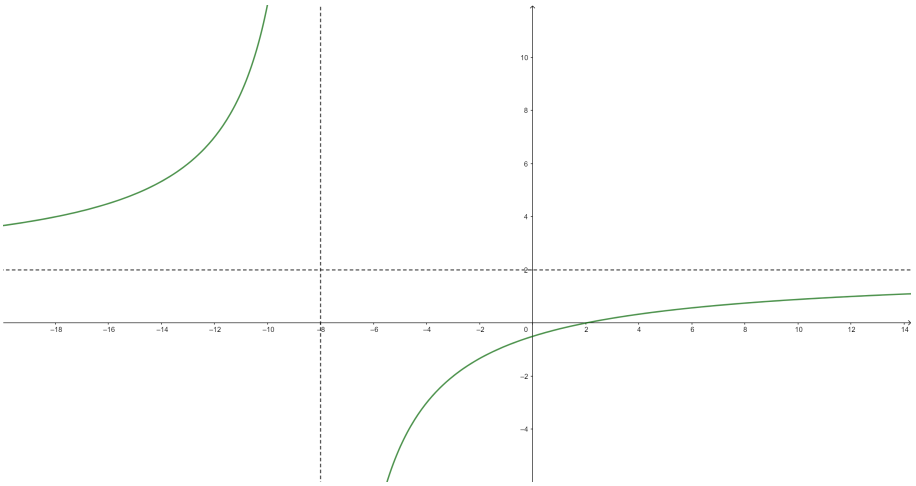
b) State the x-intercept and the coordinates of the vertex of the graph of $g(x)$.

c) Calculate the y-intercept of the graph of $g(x)$.

d) Sketch the graph of $y = \dfrac{1}{g(x)}$.

4. [Maximum mark: 8]

The graph of $f(x) = \dfrac{ax - 4}{cx + d}$ is shown below.



The graph has a vertical asymptote $x = -8$, horizontal asymptote $y = 2$ and x-intercept at $x = 2$.

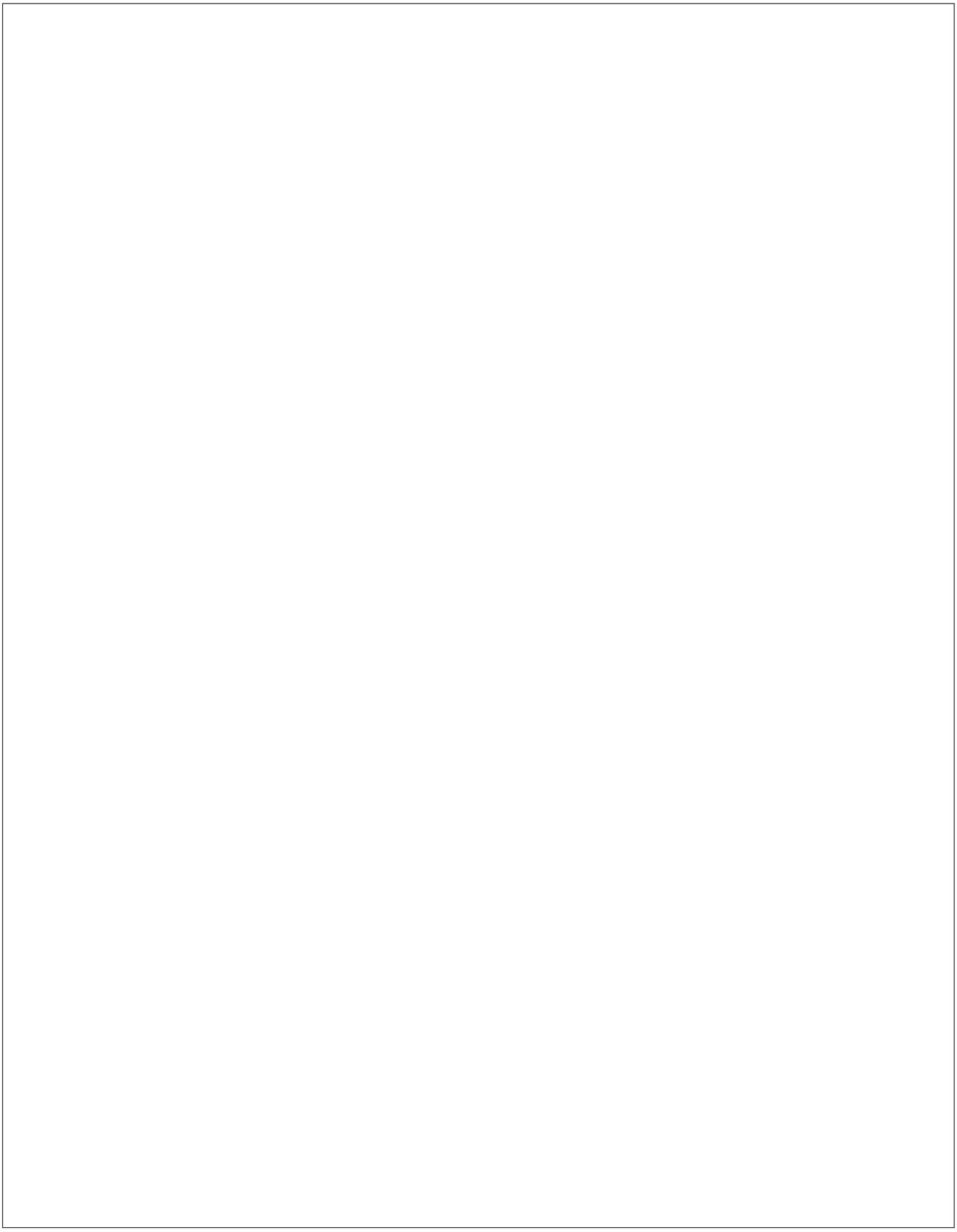
a) Find the values of a, c and d.

b) Find $f^{-1}(x)$, the inverse of $f(x)$.

c) Sketch the graph of $y = f^{-1}$ on the diagram above.

d) Solve the equation $f(x) = f^{-1}(x)$.

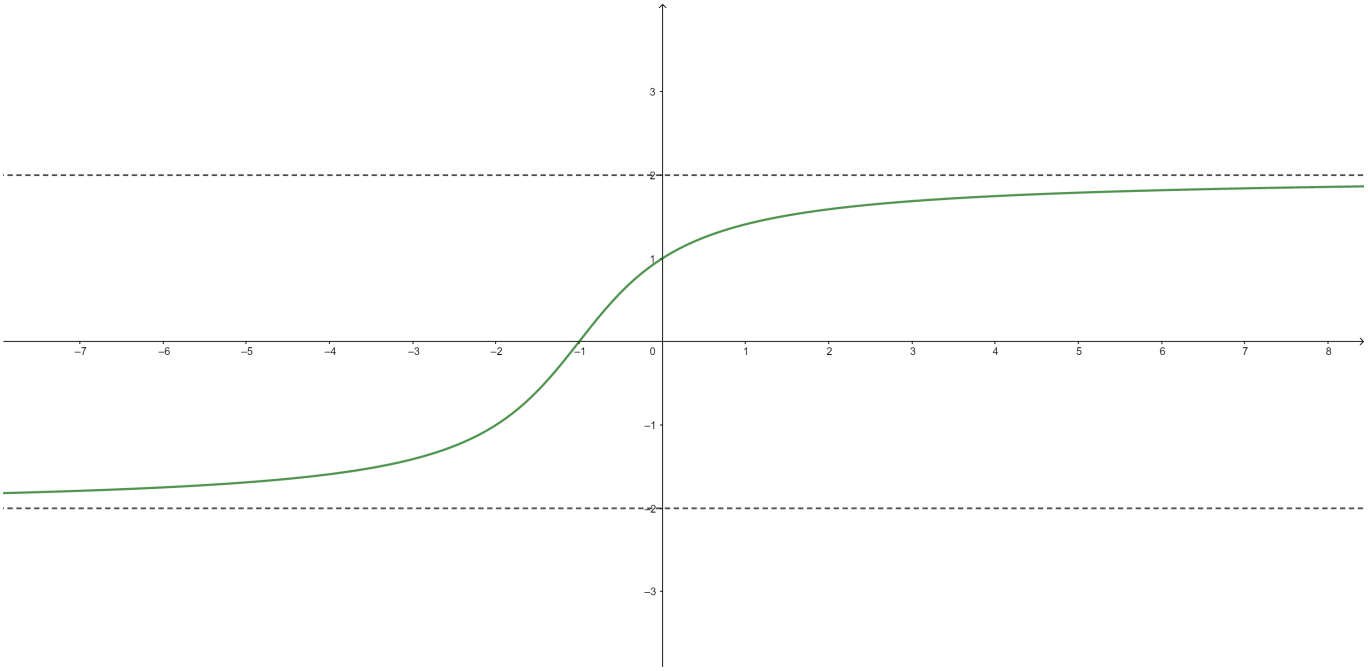
e) Solve the inequality $f(x) < f^{-1}(x)$.



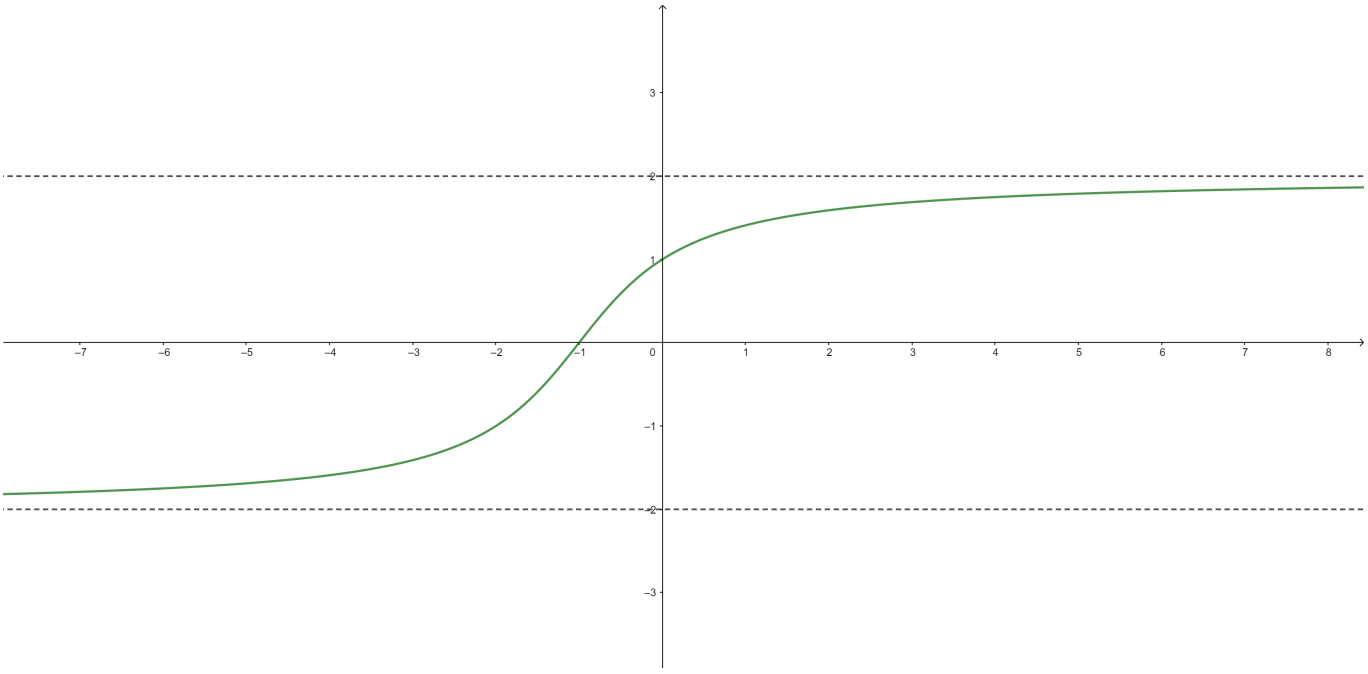
5. [Maximum mark: 8]

Copies of the graph of $y = f(x)$ are shown below. Sketch (each on separate copy) the graphs of:

a) $y = -f(x+1)$



b) $y = \dfrac{1}{f(-x)}$



c) $y = [f(x)]^2 - 1$