

These questions are designed to help you understand the material covered in week n , $n \in \mathbb{N}$ lectures. Exercise sheets will typically be handed out in the Tuesday lecture of week $n + 1$. You will get help on them in the exercise class on Tuesday or Wednesday of the same week. You should write up your solution to the starred question (*) clearly and hand it in to your assigned helper during your week $n + 2$ exercise class for feedback. Put your *full name and student number* on the top of your solution. It is important that you try to do all of the numbered questions, not just the starred question.

1. Let

$$f(x) = \frac{-x^2 + \alpha}{2x + 4} \quad .$$

where α is a real constant.

- (a) Find the asymptotes to $f(x)$.
- (a) Sketch the graph of $f(x)$ for $\alpha = 1$.

(*)2. Find any horizontal, vertical, or oblique asymptotes of [2007 exam question]

$$f(x) = \frac{2x^2}{x - 7} \quad .$$

3. (a) Define $g(5)$ in a way that extends [2008 exam questions]

$$g(x) = \frac{4x^2 - 100}{4x - 20}$$

to be continuous at $x = 5$.

(b) For what value of a is [2007 exam questions]

$$f(x) = \begin{cases} x^2 - 1, & x < 3 \\ 2ax, & x \geq 3 \end{cases}$$

continuous at every $x \in \mathbb{R}$? Justify your answer.

(c) Can $f(x) = x(x^2 - 1)/|x^2 - 1|$ be extended to be continuous at $x = 1$ or $x = -1$? Give reasons for your answers.