

- 1) Give $f \circ g$ (and its Dom) where

$$\begin{aligned} f(x) &= \sqrt{x^2 + x}, & x &\geq 4 \\ g(x) &= 2^{x-1}, & x &\leq 5 \end{aligned} \quad (10 \text{ p})$$

- 2) Characterize the function below from the point of view of continuity for each $x \in \mathbb{R}$: (10p)

$$f(x) = \begin{cases} x^2 + \sin x & \text{for } x > 0 \\ x + 1 & \text{for } x \leq 0 \end{cases}$$

- 3) Calculate the limit $\lim_{x \rightarrow \infty} (\sqrt{x^2 + 1} - \sqrt{x^2 + x})$. (10p)

- 4) Make the discussion of the function $f(x) = x - x^3$. (20p)

- 5) Calculate the following integrals:

$$\begin{aligned} \int x \cos x dx &= \\ \int \frac{\cos x}{\sin x} dx &= \end{aligned} \quad (10+10p)$$

- 6) Give the (exact) definition of $\lim_{n \rightarrow \infty} a_n = A$. (10p)

- 7) Introduce at least *two* theorems on the connection of *monotonicity* of a function and the sign of its derivative (10p)