

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

$$\begin{aligned} f(x) &= \sqrt{1-x}, & x \in (-\infty, 1] \\ g(x) &= 2^x, & x \in \mathbb{R}. \end{aligned} \quad (8p)$$

- 2) Calculate the limit $\lim_{n \rightarrow \infty} \frac{3n+2}{n+1}$ and give the threshold number n_0 for $\varepsilon = 0.01$. (8p)

- 3) Calculate the limit $\lim_{n \rightarrow \infty} \sqrt{n^2+n} - \sqrt{n^2+1}$. (8p)

- 4) Characterize the function below from the point of view of continuity for each $x \in \mathbb{R}$: (8p)

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

- 5) Give (the equation for) the tangent line to the function $f(x) = xe^x$ at point $x_0 = 1$. (8p)

- 6) Give the (exact) definition of $\lim_{n \rightarrow \infty} a_n = A$. (4p)

- 7) Introduce the *two* theorems on the connection of *continuity* and *differentiability* of functions. Show at least three functions which are continuous but not differentiable. (4p)